PRACTICAL NURSING

FOURTH EDITION

Mrs. George W. McDonald

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By AMY ELIZABETH POPE

ESSENTIALS OF DIETETICS

A QUIZ BOOK FOR NURSES

ESSENTIALS OF ANATOMY AND PHYSIOLOGY FOR NURSES

A MEDICAL DICTIONARY FOR NURSES

PHYSICS AND CHEMISTRY FOR NURSES

PRACTICAL NURSING
(WITH ANNA CAROLINE MAXWELL)

DIETARY COMPUTER

MANUAL OF NURSING PROCEDURE

ASISTENCIA PRACTICA DE ENFORMOS
(Spanish Edition of Practical Nursing)
CON LA COOPERACION DE ANNA CAROLINE MAXWELL

A TEXTBOOK OF SIMPLE NURSING PROCEDURE
FOR USE IN HIGH SCHOOLS

Practical Nursing

A Text-Book for Nurses

By

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Fourth Edition, Rewritten and Much Enlarged

By

Amy Elizabeth Pope

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PREFACE TO FOURTH EDITION

As the practical work of nursing is now almost universally taught by demonstration, endeavor has been made in compiling this new edition of *Practical Nursing* to describe the procedures used in the general care of patients and the giving of treatments in a manner to facilitate class instruction; nevertheless, items of procedures, and procedures as a whole, which cannot well be shown in class are also described and special stress is made on details that will enhance a patient's comfort, though their omission may not be noticed by those acting as subjects in class, and also details which it may be impossible to show properly in class.

Every effort has been made to describe the details of procedures and the reasons for important ones clearly enough to enable the pupils to come to class with a sufficiently definite idea of what they are to be shown to follow the instruction intelligently, to remember details, to know of any dangers that may attend treatments, and the care necessary to prevent bad effects from such treatments.

Reference is made to chemical, physical, and physiological facts that should help the students to understand the reasons for methods employed so that they may work intelligently.

As far as possible, the items of the various procedures are arranged in separate paragraphs in order to make it

easy for each instructor to tell her pupils of any differences that may exist between the methods described and those used in the hospital in which they are studying.

The methods described are those used in a number of the larger hospitals and the author has personally tested or else seen performed all the procedures described in the book.

In deciding the order of the lessons the author's aim was to place first the demonstrations of work that the pupils are usually first allowed to do in the wards and those which afford good training in lifting, carrying, and moving patients and coöperating properly in work that two or more must do together and, for convenience in description, the grouping of treatments was based on the similarity of either their purposes or the methods of procedure.

In enumerating the articles required for demonstration the ordinary furniture—beds, chairs, etc.—and the bedding were not always listed since it was taken for granted that they are always at hand.

The section on diseases is not intended as a substitute for text-books on the subject since, without making the book inconveniently large, only those diseases could be included which the pupils see most frequently in a general hospital and those which they especially need to know about in the early part of their study of nursing; moreover, space would not permit the inclusion of very detailed description of symptoms nor their causes, but many of the instructors consulted considered that a short description of the more common diseases would increase the value of the book for the younger students.

I would take this opportunity of thanking the many nurses and others who helped me with suggestions and criticism, but especially Miss Thompson, Instructor in the

Schools of Nursing connected with the University Hospitals, Minneapolis, Minn., and her assistants, who gave me a great amount of exceedingly valuable aid, and Miss Emmeline Mills, Instructor in the Peter Bent Brigham Hospital School of Nursing, Boston, Mass., and also Messrs. Lea and Febiger who allowed me to copy a number of illustrations, from periodicals published by them.

Magazines and books from which much valuable information was obtained were: *The Journal of the American Medical Association; Progressive Medicine; The American Journal of the Medical Sciences; The Journal of the American Surgical Association; Clinical Diagnosis*, by Charles Philip Emerson, M.D., J. B. Lippincott Company; *Preventative Medicine and Hygiene*, by J. M. Rosenau, M.D., D. Appleton and Company; Nelson's *Loose-Leaf Medicine*, "Prepared Under the Direction of an International Advisory Board by the World's Leading Medical Authorities," Thomas Nelson and Sons; A Text-Book of Practical Medicine, by Robert Amory Hare, M.D., Lea & Febiger; *Practice of Medicine*, by Frederick Tice, M.D., W. B. Prior Company Inc.; *The Practice of Medicine* by A. A. Stevens, M.D., W. B. Saunders Company.

AMY E. POPE.

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PRACTICAL NURSING

Practical Nursing

CHAPTER I

Advice to Student Nurses

Essentials for a successful career. How to study and remember what has been studied. Means of cultivating qualities that favor success and that further a nurse's usefulness. Nursing etiquette and ethics.

There are few, if any, professions that fit women for such a diversity of careers as a course in a school of nursing, but, as in the case of most things worth attaining, there are difficulties to be overcome before the goal is reached. How great these difficulties will be however and the degree of each individual's future success will depend largely upon (1) the individual's mental attitude, (2) the degree to which she can inspire confidence and liking in those with whom and for whom she works; (3) the amount of knowledge she gains.

A very important point in an individual's **mental attitude** is whether the interest of her work or its hardships are paramount in her thoughts. Hospital work is hard, there is no doubt about it, especially as, in addition to quite hard physical work, there is also required a very considerable amount of study of quite difficult subjects and, moreover, there is need for a constant mental alertness to avoid forgetting work that has to be done, lessons

that are studied, etc., and to observe things about patients and the surroundings that should be noted. Therefore a number of those who enter schools of nursing get discouraged and either leave or, if they are unable to do so, go about their duties, especially their studies, in a half-hearted manner and are never really happy in their work. Now, as a matter of fact, those who are ambitious to succeed and who are keenly alive to the interest of their work and anxious to learn all they can cease to be tired by their physical work as soon as they get used to it, provided they have good health, and pupils who know how to study usually find the available time quite adequate to master their lessons.

How to Study.—As their studies constitute one of the greatest difficulties of a number of the pupils in schools of nursing it seems well to say a few words about the most common causes of this difficulty, these are: (1) failure to concentrate the attention while studying; (2) failure to recall what has been studied.

Concentration implies fixing the attention upon some definite line of thought, work, etc., and banishing all unrelated thoughts from consciousness. To many people this is a difficult matter and can be done only after prolonged practice. Those who find it difficult should set themselves short periods in which they will think of nothing not related to their lesson and, at the end of the period, take a mental rest by "letting the mind wander" for a few minutes and then concentrate again for the length of time decided upon, and so on throughout the study period. At first it may be necessary to make the periods for concentration very short, sometimes not more than 10 or 15 minutes, but, if no failure of concentration is allowed during the short periods, after a few days it will be found that concentration for a longer time

is possible and then, day by day, slightly longer concentration intervals can be decided upon. It is better to start with short periods so that there will be no failures, because each failure is a set-back in forming a habit.

Failure to recall matter studied is a very common cause of its being forgotten. It has been said that, if students would depend more upon recalling what they study, the time necessary to spend in actual study would be much shortened and they would gain a more lasting memory of the subject matter.

Recall should be practiced both during study and at other times, *e.g.*, at the beginning of a study period the lesson should be read through, the more essential portions decided upon and their meaning ascertained; these portions should then be reread, several times if necessary, then the book should be closed and endeavor made to recall the gist of these paragraphs. Parts that are not remembered should then be reread and afterward endeavor again made to recall them and so on until the lesson is mastered. Later, from time to time, when doing anything that does not require strict attention, endeavor should be made to recall the lessons that have been studied. The habit of doing this can soon be formed and it will be found of greatest value. Recall should also be practiced for studies that have been already finished, as well as for those being prepared for class. It is a too common custom for pupils to put their books away at the completion of a course and think no more about it until they begin to prepare for their final examinations.

What might be called the **attitude of mind is another important** factor in study, *e.g.*, if a pupil decides that a lesson is too difficult and that she cannot learn it, she probably will not be able to do so, for such a state of mind is not at all conducive to making the necessary effort.

Certain qualities which further good work or the ability to manage people are of great help in gaining the confidence and liking which lead to success, especially conscientiousness, good memory, sense of order, courtesy, sympathy and self-control, unselfishness, good judgment, dignity.

Conscientiousness.—There are few professions in which strict conscientiousness is quite so important as in nursing, for, lacking this virtue, a nurse is likely to be careless in giving treatments and in her asceptic technic and so endanger patients' lives.

Good Memory.—Especially in hospital work, there is hardly a time while a nurse is on duty that there is not something that she must remember to do at a stated hour. There are fortunate individuals who remember without effort, there are others who are always in trouble and getting other people into trouble, by their forgetfulness. To overcome this fault one must (1) pay strict attention when being told to do anything or how to do it; (2) make a point of recalling the instruction to mind and, in order to be sure of doing so; (3) decide upon something that, for example, will be seen or heard and aid recall; for the probability of remembering anything depends largely upon (1) the strength of the original impression (and this is likely to be very weak if the mind is wandering when an order is received); (2) the number of times it is recalled; (3) the number of associations connected with it that will aid recall.

Order.—Items to be considered under order are: (1) Learn to work neatly and without letting the surroundings become disordered; (2) "have a place for everything and put everything in its place," because a serious mischance may occur in emergencies if there is delay in find-

ing a misplaced instrument; also having a definite place for the various requisites on treatment trays and the like makes it easier to be sure that nothing is forgotten; (3) acquire the habit of planning your work so that the various tasks may be done in the most advantageous sequence; this is often of great help in the speedy accomplishment of work, and pupils who learn to plan their work well are more likely to make good head nurses and supervisors than those who do their various tasks without any thought of systematizing the order in a manner to expedite the work.

Observation.—The faculty of observing keenly and quickly is a very important gift for nurses to possess and it is a quality that the majority of people lack, and lack for want of cultivation, therefore student nurses should be on the alert to notice their surroundings, to observe quickly any change in a patient's condition and if anything, *e.g.*, a bright light, is annoying a patient. Also they must train themselves to observe what is needed for treatments and the methods of different physicians so that they may be able to anticipate each physician's wants and thus facilitate the work.

Tact.—*Tact has been defined as the power of doing and saying the right thing at the right time.* To possess it in a marked degree requires the ability to read character quickly since the right thing to say on many occasions depends upon the individual to whom it is said. For this reason nurses should know something of psychology and pupils who have not already studied this subject should, if it is not included in the curriculum of their nursing school, read one or more of the newer textbooks of psychology.

Courtesy.—Courtesy has been defined as *a well-bred consideration for others founded on kindness.* Frequent

complaints are made of nurses because of their brusque manner and their unwillingness to give information regarding their patient's condition. The former is often due to press of work, and even women well versed in the essentials of good manners are, when busy, apt to be guilty of discourtesies. This tendency should therefore be kept in mind and carefully guarded against. For various reasons it is often unadvisable for a nurse to give information regarding patients. When such is the case, inquirers should be referred to the head nurse or doctor, but this should be done in such a way as to give the impression that the information is withheld because it had better come from a higher authority, and not from unwillingness to give it. When dissatisfaction arises, a nurse should never engage in argument, but refer the patient or his friends to the proper authority. It is to be realized that being in a hospital or having a relative there is often a trying ordeal, especially when the patient is seriously ill and the ordeal is intensified by discourteous, or even uninterested, treatment on the part of any of the nurses, if for no other reason than that it creates the impression that the patient will not be kindly treated.

Sympathy and Self-Control.—The claim is often made that nurses are unsympathetic. This is certainly untrue of the majority, but the constant contact with suffering, the necessity to exert self-control at all times, and to get through with the work no matter what happens, does tend to make those in a hospital forget that an occasional expression of sympathy and encouragement is often sadly needed, both by patients and by fellow workers. Moreover it goes a long way toward gaining the confidence of the patient and her friends regarding the treatment that the former will receive. Thus, whenever necessary every

opportunity should be taken to express sympathy in some way, but it is to be remembered that it is false sympathy which will allow a nurse to be slack in carrying out a surgical dressing or other treatment because it will cause pain or that will allow a nurse to lose self-control, and thereby her usefulness, in emergency; this must never be done, no matter how distressing the circumstances may be.

Unselfishness.—In the past more work was expected of nurses, both students and graduates (as of most other workers), than should have been demanded and the natural result has been a growing tendency on the part of nurses to be chary of rendering services that they do not consider "their work" and an unwillingness to stay on duty longer than their legitimate time. This is very unfortunate for, though women engaged in such hard work as nursing should not be imposed upon, there is probably no other set of people, except those of the medical profession, who come in contact with tragedies where willing, generous help is needed to the extent that nurses do and refusal of help under such circumstances, unless absolutely necessary, brings discredit upon the profession as a whole. It has been said that in this connection the nurses' slogan should be "be generous, but do not be imposed upon." Even in those States in which the number of hours that the pupil nurses can be kept on duty is regulated by law, the pupils must realize that in a place like a hospital, where emergencies and the need for extra work frequently unavoidably occur, it is often necessary for pupils to remain on duty over time and those who are not willing to do so should prepare for some profession in which they can stop work on the stroke of the hour, for they will never be able to count on doing so when caring for the sick. Moreover, if a pupil's work is

frequently unfinished when it is time to go off duty, she had better make sure that it is not her own fault and, if so, she must realize that it is then up to her to finish her work before she leaves and to strive to do it more speedily in future.

Good Judgment.—By good judgment in this instance is meant *the ability to decide what is the best thing to say or do under any given circumstance.* Various types of circumstances calling for prompt judgment are likely to occur frequently in the hospital and poor decisions are often a source of great annoyance to others, as well as to the individual. Those who have not been used to responsibility are apt to make several errors at first, but by always observing where and why their judgment failed they may profit by their failures.

Dignity.—While on duty a nurse should always be quiet and dignified. She should be cordial, without being familiar, with the patients and those working under her. A very important point to be realized is that the hospital proper is not a place for social intercourse or amusement. Any frivolity or lack of dignity in demeanor in the wards, the patients' rooms, or environment is sure to call forth criticism and, unfortunately, not of the individual offender only, but of the profession.

In connection with dignity the **nurses' uniform** may be mentioned for this, if neat and clean, certainly adds to a nurse's dignity, if only because of its associations. The chief reason for mentioning it is to state that jewelry and other forms of adornment should not be worn with it. The uniform is in many instances a nurse's passport and protection under circumstances in which an impersonal, professional, dignified bearing is imperative and jewelry, etc., is not in keeping with the impression that the uniform is intended to create.

Professional Etiquette and Ethics

Since the object of this chapter is to draw the pupils' attention to qualifications which will remove obstacles from their paths a few words regarding professional etiquette and ethics will not be out of place.

The word **etiquette** was adopted from the French. It signifies the conventional rules required by good breeding, especially those to be observed toward particular persons or in special places, such as courts, armies, and, in the present instance, hospitals. A greater amount of etiquette has always been required in hospitals than in any other educational institution, except the army schools, and it has been insisted upon in hospitals for the same reasons that it has been used in the army, viz., it is thought that a deferential attitude, such as standing erect, when receiving orders or instruction from one in command is more likely to be associated with the strict attention necessary to prevent mistakes than a lolling, undeferential posture and the deference required to be shown those in charge is believed to help further the idea of prompt, unquestioning obedience that in nursing, as in the army, is indispensable.

The word **ethics** is derived from the Greek *ethikê*, a word which originally meant nothing more than habit or custom and was first used in its present significance—the science of moral duty or moral law—by the Greek philosopher Aristotle in certain of his writings. A moral law differs from a legal one in that it is determined by a sense of honor and kindly feeling and not necessarily, as a legal law, by legislation.

The word is used in a comprehensive sense to include man's moral duty, not merely to those individuals with whom he may be brought in close contact, but also to all

mankind and even the inferior animals. In nearly all professions, however, there are various special moral obligations that are of importance to maintain the standard of the profession at a high level and these constitute the ethics of that profession.

The ethics or moral laws which nurses and student nurses should comply with may be classed under three headings, viz., (1) those due the hospital in which they are working and its authorities; (2) those due their patients; (3) those which they owe to each other and all other members of their profession.

Some of the important obligations due the hospital and its authorities are: (1) That the nurses, graduates or pupils, so conduct themselves that they will do their part to make and maintain the good reputation of the institution. (2) To report to the right person conduct on the part of a nurse, especially a pupil, which is likely to discredit the hospital. (3) Economy—the careless waste of food, surgical dressing, etc., the unnecessary use of clean linen, and the destruction of furniture and utensils through carelessness are, in some hospitals, appalling, and this in a place like the hospital is especially to be deplored, since waste means either extra expense for people, the majority of whom can ill afford it, or loss of money contributed for the use of the poor. Moreover nurses carry the habit of waste formed in the hospital into their private practice and thus unnecessarily increase the expenses of illness which many of their patients have trouble to meet. (4) Obedience—when women come to a school of nursing they are supposed to be old enough to realize that the rules made for an institution are a necessity and that the childish habit of trying to evade them and see how many they can break is out of place in a hospital where the work is of such a serious

nature. (5) Restraint from grumbling and adverse criticism of those in authority—one discontented grumbler can spoil the morale of an entire class and create a spirit of discontent and unhappiness throughout the school; therefore, if there is no just cause for grumbling, the pupils should themselves take steps to put a stop to it; if there is just cause, why, there are other hospitals; let those who find conditions too intolerable in the one they are in try another, but, so long as they remain in a school, professional ethics demands that they refrain from adverse criticism.

The more important obligations that a nurse owes her patients are: that she faithfully carry out the doctor's orders, give the patients conscientious care, treat them and their friends with courtesy, and that she keep inviolable any secrets of patients or their families or friends that come to her knowledge. When people are ill and in trouble they are apt to talk of things which in their calmer moments they would not mention, and it is exceedingly dishonorable to repeat anything learned under such conditions. In fact, the safest and most honorable course is to avoid all discussion of patients beyond the giving of necessary professional information to those supposed to receive it and the usual reports to inquirers. Many a nurse has had cause bitterly to regret a few careless words dropped about a patient under her care, or being unwittingly drawn into a discussion of former patients and their ailments.

If nurses would follow more closely the principles of the pledge which in many hospitals they are required to take at graduation, they would be less likely to commit the indiscretions for which they are often justly blamed. That all may become familiar with the precepts of the pledge, it is given here.

The Florence Nightingale Pledge.—"I solemnly pledge myself before God and in the presence of this assembly to pass my life in purity and to practice my profession faithfully. I will abstain from whatever is deleterious and mischievous, and will not take or knowingly administer any harmful drug. I will do all in my power to elevate the standard of my profession and will hold in confidence all personal matters committed to my keeping, and all family affairs coming to my knowledge in the practice of my calling. With loyalty will I endeavor to aid the physician in his work and devote myself to the welfare of those committed to my care."

Almost any question of **one nurse's obligation to another** can be answered by the application of the Golden Rule, "Do unto others as ye would that they should do unto you"; for the obligations of the members of any profession one to another are that they have a specially friendly feeling one for another and be particularly ready to lend one another a helping hand.

CHAPTER II

Some Facts of Bacteriology that it is Especially Important for Nurses to Know

Definition of Bacteriology. Nature of bacteria and their spores. Where bacteria are found. Method of reproduction. Conditions which favor reproduction and the activity of bacteria. Classification of bacteria, protozoa, moulds, and yeasts as causes of disease. Nature of infection. How germs enter the body. The body's defenses against bacteria. How bacteria produce their harmful effects in the body. How infection is transmitted. Means used to destroy bacteria. Measures employed to prevent transmitting and acquiring infection.

Bacteriology is said to be *that branch of Biology which treats of bacteria.*

Nature of Bacteria.—Bacteria, which are also referred to as microörganisms, microbes, and germs, are one of the smallest and simplest species of life known. They are for convenience classed with the group of colorless plants known as fungi, but some of their characteristics more nearly resemble those of animal than vegetable life. A bacterium may be described as an exceedingly minute, transparent, colorless, unicellular organism, consisting of cytoplasm,[1] that is surrounded by a wall and has, in or near the center, a small body called the nucleus[1] which controls the metabolism[1] of the cell. Some bacteria have

[1] For explanation of these terms see glossary or any textbook of Anatomy and Physiology.

fine thread-like projections, known as *flagella*, extending from their wall, and such organisms have the power of independent movement, the flagella propelling the bacterium by a lashing motion.

Spores.—Some forms of bacteria when examined under the microscope are seen to contain a small, round, highly light-refractive body. This is known as a spore. Bacteria that are capable of spore formation are much more difficult to destroy than others, because a spore is infinitely more resistant to unfavorable conditions than the rest of the cell, and when conditions occur that cause the destruction of spore-bearing bacteria, the spores may survive and, when favorable conditions are once more resumed, develop into the same kind of organisms as those from which they come.

Where Bacteria are Found.—Bacteria are almost omnipresent wherever organic life exists, they are in the air, except at very high altitudes; and possibly over the ocean far from land; on the surface of objects exposed to the air, except those that will destroy bacteria, as exceedingly hot matter; in the soil for a considerable depth; in most water, even rain water will contain bacteria absorbed while passing through the air, but salt water, as that of the ocean, is usually almost germ free, for salt solution has an unfavorable influence on bacterial protoplasm. Numerous bacteria of various species are always present on the surface of the human body and they exist in large numbers under the nails, in the mouth, alimentary tract, the upper air passages, and the external genito-urinary ducts; thus they are always present in body discharges, more especially the feces.

Method of Reproduction.—Bacteria multiply by fission or division, *i. e.*, they increase in size and then divide into two equal parts. Under favorable circumstances,

cell division takes place very rapidly, about every twenty minutes, and it has been estimated that if cell multiplication went on unchecked for twenty-four hours, one bacterium would in that time have 140,-750,000,000 descendants. It is, however, impossible for bacteria to increase with quite such rapidity because their surroundings after a while become unfavorable owing to the presence of acids and other substances produced by the bacteria, either as the result of the disintegration of the substances upon which they feed, or of the waste products given off from their bodies.

Conditions which Favor the Growth of Bacteria.—These vary somewhat with different species of bacteria, but all kinds of bacteria need food, warmth, moisture, and an absence of sunlight. Thus it can be seen that warm, dark, moist places are propitious for the development of bacteria. The reaction of the medium upon which they are growing is of importance to most bacteria; nearly all varieties grow best in a neutral medium or one that is but slightly acid or slightly alkaline. Some bacteria require oxygen—air—others thrive better in places where there is little air, and others live equally well with or without air. The temperature in which bacteria grow best varies for different species, but for the majority of varieties a temperature between 75° and 100° F. is the most favorable.

Food.—The majority of bacteria, unlike the higher species of plants, require organic food, either vegetable or animal, for their sustenance. One reason for this is that they do not contain chlorophyll, the green coloring matter of plants, by virtue of which plants, under the influence of the sunlight, are enabled to use the carbon dioxide (CO_2) and water (H_2O) for their nourishment and to put together the elements carbon, oxygen, and

hydrogen and various others, as nitrogen, sulphur, and iron, which they get from the soil, to form the substances of which they are composed. Some species of bacteria feed upon dead vegetable and animal matter, these are known as saprophytes,[1] others subsist upon living tissue, these are classed as parasites.[2] Most of the bacteria that cause disease are parasites and, fortunately, the majority of these parasites survive but a short time after they are discharged from the body. However, their life is likely to be prolonged if they are embedded in moist body discharges.

Pathogenic and Non-Pathogenic Bacteria.—Only a relatively few species of bacteria are harmful to man, those which are said to be *pathogenic*, which means disease producing. Those which do not induce disease are said to be *non-pathogenic*. Non-pathogenic bacteria are very useful to man in many ways, in fact they are essential for the continuance of organic life. Their various uses will be learned when studying Bacteriology, space will not be taken to discuss them here, since this chapter is intended merely to give information that, until the real study of Bacteriology is commenced will be of use in helping the pupils to understand various references to the causes and nature of disease and to appreciate the necessity for the precautions they are told to take for their own and their patients' welfare. It can be easily realized that more precautions are necessary in hospitals than in other places since many of the patients in a hospital are the victims of bacterial infections that can be contracted and transmitted to others.

Classification.—Bacteria are variously classified. Two

[1] From a Greek word signifying putrid.

[2] From a Greek word used for any animal or plant subsisting at the expense of another organism.

classifications have been already given, viz., pathogenic and non-pathogenic bacteria, saprophytes and parasites. The only other classification that need be mentioned here is that depending upon the shape of the bacteria and their method of grouping when grown in culture media.[1] This classification is an important one to know because the names of the various types of bacteria are based upon it.

With reference to their shape, bacteria are classed as:

(*a*) Cocci, singular coccus, round.

(*b*) Bacilli, singular bacillus, rod-shaped.

(*c*) Spirilli, singular spirillum, spiral-shaped.

Cocci.—The cocci are round or somewhat oval-shaped microbes about $\frac{1}{25,000}$ of an inch in diameter. According to their method of divisioning and grouping in culture media, they are known as:

(*a*) Streptococci—which divide in one plane and, when they remain connected after division, occur in chains.

(*b*) Staphylococci—these divide in two planes and, when they remain connected after fission, they form grape-shaped structures.

(*c*) Diplococci—these tend to remain grouped in pairs.

(*d*) Sarcinæ—which divide in three planes and, when they remain together after fission, form cube-like bundles.

Bacilli.—The bacilli are all, as their name signifies, rod-shaped, but there are several variations in their form; thus, certain species of bacilli have rounded ends, others are square or club-shaped, others are of an almost oval shape, etc. Bacilli also vary considerably in size, but average about $\frac{1}{60,000}$ of an inch in length.

Spirilli.—These are spiral-shaped microörganisms. Some species have but one curve and are comma-shaped, others have two or more curves and are likened to a cork-screw.

[1] Substances used for cultivating bacteria.

Infection.—When microörganisms enter the body and there multiply and produce abnormal conditions the process is spoken of as infection. The mere presence of microörganisms does not constitute an infection, for, though the body is normally sterile at birth, within a short time the skin and all exposed mucous membranes and those covering the body passages that communicate with the exterior of the body become contaminated with bacteria and this condition persists throughout life.

Many of the organisms usually present are non-pathogenic, but some of the species that are constant habitats of the human body are capable of producing disease; however, even these will not cause infection, unless the outer covering of the skin or mucous membranes become affected in a manner to allow the bacteria to penetrate to tissues that are susceptible to their influence.

Bacteria are the most common incitants of infection, but a few infectious diseases (*i. e., those that can be transmitted from one person or animal to another*) are caused by: (1) **protozoa** (*i. e., small, unicellular animal organisms such as ameba and the organism which causes malaria*); (2) certain species of moulds and yeasts; (3) presumably by what are known as filtrable viruses, *i. e.*, organisms that are so small that they pass through a Berkefeld filter and cannot be discerned through the microscope. Also there are certain multicellular organisms, such as tapeworms, that may cause pathological conditions in man, but these are said to infest, rather than infect, the body.

How Bacteria Enter the Body.—The channels through which microörganisms most commonly enter the body are: abrasions in the skin and mucous membranes, abnormal tonsils, adenoids, necrosed teeth, infected sinuses (*cavities in certain of the skull bones that directly or indirectly communicate with the nose*), the respiratory and

alimentary tracts. A few species of organisms may do harm if they enter through any of these channels, but the majority of species are only harmful when they enter through a certain pathway; for examples, to cause typhoid fever, the typhoid bacillus must enter through the alimentary tract, to induce malaria the malarial organism must be injected into the blood by a mosquito.

After germs penetrate the outer barriers of the body if they are not destroyed by the substances in the blood and lymph which serve to destroy bacteria, they may remain near the area of their entrance and induce characteristic local conditions, *e. g.*, inflammation, or, with or without causing local conditions, they may reach the blood or lymph streams and be carried about the body. They may then be deposited in the tissues of an organ or organs. Some species will find suitable conditions for their propagation in almost any organ, but many species can only affect certain tissues and will only live and cause disease if they reach one suitable for their influence.

Some of the harmful effects induced by bacteria are the result of local conditions produced in the tissues they invade, but the majority of the abnormal conditions associated with infection are due to the action on the body or a part of it of various kinds of toxic substances. These substances may be (1) formed in the bodies of the bacteria and discharged from them in some species during the life of the germs, in others after their death and disintegration; (2) the result of disintegrative changes in body tissue caused by the bacteria. These toxic substances may be absorbed by the blood and lymph and carried about the body and induce pathological conditions in parts remote from their formation.

Focal Infection.—When germs remain located in a small area the condition is spoken of as a focal infection.

A focal infection may be acute or chronic, mild or virulent. Some of the germs in a focus may be taken up by the blood or lymph stream and carried to another part and start a secondary focus. Some of the most common locations for primary foci are: the tonsils, cavities in the skull bones known as sinuses, necrosed teeth, and the alveoli or sockets of the teeth. Mild chronic infections may cause but little disturbance in the area, but the toxic substances they produce are absorbed by the blood and lymph and, even when not of a virulent nature, they are likely to, in the course of time, cause anemia and other abnormal conditions and, if germs are carried to other parts and start a secondary focus, their new environment may afford a more suitable ground for their propagation and a virulent infection will result; for example, a severe acute attack of appendicitis may be due to germs carried to the appendix from slightly abnormal tonsils.

The Body's Defenses Against Bacterial Invasion.— These are classed under two headings, primary and secondary. The primary defenses are: the outer covering and secretions of the skin and mucous membranes and the gastric juice. The secondary ones are: (1) internal fluids and secretions; (2) substances known as antitoxins which are formed by body cells when they are injured by toxins produced by certain species of bacteria, these then unite with the toxins and prevent further injury of the body cells; (3) various substances in the blood and lymph which destroy bacteria; some of these are normal constituents of the blood, others are formed as the result of bacterial invasion and most of them are, like the antitoxins, more or less specific in their action, *i. e.*, they act only or chiefly upon germs of the same species as those which induced their formation; this is why one attack of most of the infectious diseases affords immunity, *i. e.*,

protection against subsequent attacks of the same disease; (4) the reaction of body cells to the presence of certain types of bacteria. A particularly interesting type of reaction is that seen in tuberculosis and in syphilis, in which diseases certain of the tissue cells in the invaded areas proliferate and form a wall around the invading bacteria and thereby either destroy them or inhibit their activity.

How Infection is Transmitted and Acquired.—The principal ways in which infection is transmitted are: (1) by contact with a patient or discharge containing the virus (*i. e., the infective principle*); (2) by carriers; (3) by droplets; (4) by fomites and infected utensils and other implements; (5) flies, vermin, mosquitoes; (6) by infected water and food; (7) dust.

Only a few of the infectious diseases are acquired by **contact** with a patient, those which are said to be contagious, but, either directly or indirectly, the **body discharge containing the virus** is the chief source of infection.

By **carriers** are meant people who harbor the causative germs of a disease in their system, but are not themselves affected by it. A person's immunity to a disease is sometimes, but not always, due to a previous attack of the disease; for examples: (1) after recovery from typhoid a person may continue to harbor the typhoid bacillus in, usually, the gall-bladder for years and some of the bacilli may be constantly passed in the feces and thus render the infection of other people possible, though the individual has no symptoms of typhoid fever; (2) those caring for a patient with pneumonia may have the causative organism in their mouth and transmit the disease to other people, though they (the carriers) do not contract the disease. A person in ill health is far more likely to contract infection than one who is strong and robust.

When a person has a disease due to an organism that is given off in the mouth or bronchial secretions she will in coughing, sneezing, and the like emit numerous minute **droplets** that may be teeming with bacteria. Such droplets may be ejected to a distance of 3 or 4 feet and remain suspended in the air for an hour or more. They may be inhaled by other people and thereby cause infection or they may fall upon objects and contaminate them and people touching these objects before the virus is destroyed by drying may become infected.

By **fomites** are meant substances that will absorb and transmit infection: handkerchiefs, sheets, clothing, etc., that become contaminated with excretions containing the virus of a disease are thus classified.

Flies are a very common source of infection transmission because they alight on infected excreta, etc., and later on food; as Dr. Woods Hutchinson writes: "The fly breeds in dirt and it feeds on food and, as it never wipes its feet, the interesting results can be imagined."

Malaria is the only disease transmitted to any extent in this country by **mosquitoes,** the way in which they cause infection is described under Malaria.

Water may become contaminated by infected sewage, flies, and dust, and by being put into a contaminated vessel.

Food may be contaminated by such means as being sprayed or washed with infected water, flies, dust containing a virus, the hands of a carrier or of a person, not necessarily a carrier, who has been in contact with a patient or fomites, etc. Milk and meat from tuberculous cows may transmit what is known as bovine tuberculosis to children, though adults are not usually susceptible to this form of infection.

Dust is not now thought to be a very common source

of infection because it has been found that few pathological germs withstand drying, but it may possibly contain living pathological organisms, especially the tuberculosis bacilli, and people who expectorate on the street are largely responsible for this source of infection.

Means Used to Destroy Bacteria.—These are: exposure of contaminated articles to sunlight, heat, disinfectants (*i.e., chemicals that kill bacteria*), antiseptics (*i. e., chemicals that inhibit the activity of bacteria, but do not destroy them*). Destruction of germs by heat is spoken of as *sterilization* and that by the use of chemicals as *disinfection.* The names and nature of the disinfectants and antiseptics in common use and the strengths in which they must be used will be learned in Bacteriology.

The measures used to prevent the spread and contraction of infection are described in connection with the communicable diseases in Section 3, only a few need be mentioned here, viz.: All **discharges that contain the causative virus** of a disease must be disinfected or burned and every possible precaution must be taken to prevent them contaminating anything. The infective discharges vary with different diseases, this will be seen in the description of the infectious diseases. The method of disposing of excreta and the disinfectants used vary in different hospitals but whatever the method important points to remember are: (1) that the disinfectant must reach the germs in order to destroy them and, therefore, all large lumps of feces should be broken with a spatula, or whatever the hospital provides for the purpose, and immediately after use this must be put into boiling water and sterilized, it must not be allowed to touch anything; it is not necessary to break lumps of feces if the excreta are sterilized because the heat will penetrate the mass; (2) exactly the amount and strength of disinfectant

necessary is to be used; (3) the discharge must be exposed to the disinfectant or heat for the time specified and during the disinfection the utensil must be kept covered, this is necessary when a gaseous disinfectant, as formaldehyde, is used to prevent the escape of the gas and it is always necessary to prevent the access of flies; (4) bichloride of mercury should not be used for the disinfection of excreta, because all body discharges contain protein and the mercury unites with this to form an albuminate of mercury which has not germicidal properties.

When the virus is in the nasal, mouth, or bronchial secretions pieces of paper or soft muslin should be substituted for handkerchiefs and these are put into a paper bag and burned after use. It is customary to keep a paper bag pinned to the bed (out of sight) that it may be at hand when needed. It is also very important to notice if any sputum reaches surrounding articles when the patient coughs, etc., and, if this happens, to disinfect anything that becomes contaminated at once; green soap and lysol are good disinfectants to use for the purpose, nothing that will be ruined by being thus disinfected should be allowed near the bed of a patient with an infectious disease. It is customary to disinfect the feces, as well as the respiratory discharges, when the virus is given off in the latter because germs may possibly be swallowed and given off in the feces.

Sheets, etc., taken from the bed of a patient with an infectious disease should not be put on the table or chairs, but each piece should be, **at once,** put into a bag or whatever the hospital provides for the purpose and, when putting it in, it must not be allowed to touch the outside, and to help prevent them doing so, before contaminating your hands, turn over the upper 3 or 4 inches of a bag with the outside undermost. When everything has been

put into the bag wash and disinfect your hands and tie the bag. Sheets, etc., that are soiled with the infective discharge should be put into a pail of water or disinfectant. The after disposal of infected clothing varies in different hospitals, whatever the rules, they must be rigidly adhered to.

Flies are to be excluded from wards, rooms, and lavatories and, should they enter, be killed at once, this is very important.

Care of the hands is another exceedingly essential matter. In the first place, they must be kept in good condition by the frequent use of a lubricant, for, if they are rough and chapped, it is difficult to disinfect them and the frequent scrubbings and disinfection necessary in the hospital tend to bring about these conditions. Also, whenever possible, forceps should be used for handling soiled gauze and the like. After working over a patient with an infectious disease, or after handling infected linen, utensils, etc., the hands should be immediately thoroughly scrubbed with hot water and green soap or whatever disinfectant the hospital provides for the purpose. It is to be realized, however, that the scrubbing is the essential item, merely plunging the hands into a disinfectant, as is sometimes done, is about useless. Also nurses should always wash their hands thoroughly before going to meals, even when the patients they are caring for have not an infectious disease. To avoid contracting local infections which may lead to serious inflammation, scratches and cuts should be covered with collodion and, immediately upon receiving a scratch, cut, or pin prick the part should be painted with iodine, this is especially necessary when the pin has been around a patient who has a suppurating wound; many a nurse has acquired a verv serious infection from a pin prick.

CHAPTER III

Care of the Ward and its Furnishings

Ventilation. Dusting. The care and cleaning necessary for the proper condition and preservation of: sinks, toilets, and the like, ward utensils and linen, instruments and rubber appliances.

Essential conditions in a ward or sick-room and the environment are:

They must be: (1) Properly ventilated; (2) free from unpleasant odors; (3) kept at a uniform temperature (the degree required will, in some cases, depend upon the diseases from which the patients are suffering); (4) free from dust and dirt; (5) there must be a definite place for all furniture and utensils and everything must be kept in its place when not in use (this is especially important in the case of instruments and other articles that are likely to be needed in a hurry); (6) the furniture and furnishings are to be, as far as possible, free from stains and other defacement.

In order that such conditions may prevail it is necessary for nurses to understand something of the physical processes upon which ventilation depends and of the chemical and physical processes involved in cleaning.

Demonstration 1

Methods of Ventilation

If the hospital is ventilated by mechanical means, the pupils will be shown as much of the system as possible

and in preparation for the lesson they should read in their textbook of Physics the sections devoted to the following subjects: The principles involved in artificial and natural ventilation[1]; the nature and causes of convection[2]; the meaning of relative and absolute humidity[3], the nature and causes of evaporation[4] and the diffusion of gases[5]; the nature and results of photosynthesis and metastasis in plants.[6] Also they should read the sections on the composition of air and ventilation in their textbook of Hygiene.

As the result of their reading the pupils should be able to answer the following questions, to give the reasons for the procedures necessary for ventilation that are mentioned on pages 30 to 33, and to demonstrate methods of arranging the windows and ventilators.

State the chemical composition of pure air.

What is the average composition of air as it issues from the lungs?

What forces of nature are made use of in ventilation?

Why does heated air rise?

What is meant by convection?

Where will you provide an exit for air from a room that is ventilated by natural means?

Why is this not always necessary with mechanical ventilation?

[1] The page references given here are for the revised edition of *Physics and Chemistry for Nurses*, Pope, G. P. Putnam's Sons, but the information required will be found in any textbook of Household Physics.

[1] Pages 8 to 12. [2] 79 to 81. [3] 60 to 62. [4] 55 to 57. [5] 61. [6] 301 and 302.

Nothing is said here regarding air space requirements and industrial impurities of the air, because the author has found that these subjects are better appreciated if studied later in connection with Institutional Management and Sanitation.

Why will a fire in the grate assist in ventilation?

What causes a draught?

What is wind?

To what is wind due?

What is meant by humidity?

Why does humidity become excessive very quickly in a badly ventilated room in which there are a number of people?

What is the result of excessive humidity upon the body's heat-regulating capacities?

Why are the bad effects of humidity increased when the room temperature is high?

Why will the presence of growing plants in a room help to keep the air pure in the daytime but not at night?

Where does the world's supply of atmospheric oxygen come from?

Ventilation has been defined as "the continuous introduction of pure air into a room or building, thoroughly mixing it with the contained air, and the simultaneous extraction of a like quantity of impure air."[1]

In order to ventilate a room or building properly the following points must be observed:

The incoming air must be pure.

The air in the room must be kept in as active movement as possible without the motion becoming perceptible to the inmates, *i. e.*, without causing a draft. The more important factors determining the amount of air movement in a room are: (a) difference in the temperature of the incoming air and that in the room, the greater the difference the more intense the movement; (b) the volume of incoming air; (c) the relative position of the openings for the entrance and exit of the air. If the open-

[1] *Principles of Hygiene*, p. 66. Bergy. W. B. Saunders & Co.

ings are directly opposite each other a draught can be created through that part of the room without inducing enough air movement in the rest of the place to keep the air pure.

The space for the entrance of air should be larger than that for the exit.

If there are two windows in a room one should be opened at the top and the other at the bottom. If there is only one window, unless it can be opened widely, better ventilation will be secured by opening it at the top and bottom than by the same space of opening in one place only. In very cold weather there may be so much difference between the temperature of the incoming air and that in the room that an arrangement such as shown in Fig. 1 may induce enough movement in the air to secure good ventilation. As shown in Fig. 1 a narrow board is placed beneath the lower sash so as to raise the upper edge of the latter above the level of the bottom of the upper sash and the cold air entering between the two sashes is deflected upward, and thus it will not impinge upon the people in the room.

Fig. 1. The arrows indicate the direction taken by the incoming air.

Cause of odor, etc.—It is very commonly thought that the odor in a badly ventilated room and the lassitude and headache that the inmates often experience are due to the excessive amounts of carbon dioxid that collect, but CO_2 is an odorless gas and it has no actual injurious

effects on the system in the amounts in which it ordinarily accumulates in houses and hospitals. In reality, the odor is commonly due to decomposed skin excretions and to exhalations other than CO_2 given off in the breath from, chiefly, the stomach and mouth; and the lassitude, etc., are principally the effect of dilatation of the blood-vessels in the skin and the consequent increase in the amount of blood in these vessels, which results in depletion of the quantity in the cerebral vessels; interference with heat elimination. These effects are due to: (a) deficient air movement; (b) excessive humidity; (c) too high room temperature.

Though the emanations mentioned in the preceding paragraph are not injurious to health, they are not to be tolerated in house or institution because they are signs of poor ventilation, and consequently of the presence of the harmful, though less easily appreciated, conditions. Unfortunately, the olfactory nerve endings become accustomed to stimuli very quickly, and thus after a person is in a badly ventilated room for a short time consciousness of the odor diminishes. Therefore, nurses should accustom themselves to being on the alert when they enter rooms to detect odors and to at once remedying matters.

Precautions necessary to prevent odors in hospitals, in addition to adequate ventilation, are:

1. Cover bedpans as soon as you take them from patients. Keep them clean—free from the smallest speck of soil—and deodorize them when necessary. Formaldehyde is a good deodorizer to use for this purpose.

2. Prevent the bed covers from becoming permeated with fecal odor by replacing them with a bath blanket (which can be aired) when you give the patient an enema.

3. Keep the patients and their bedding clean.

4. See that dressing and garbage pails are emptied on time and that they are kept clean, that hoppers and toilets are properly flushed (*i.e.*, until every particle of waste is washed off) and a deodorant used when necessary, as, for example, after emptying a particularly offensive stool.

5. Keep waste pipes of sinks and hoppers free from obstruction. Fat is a common cause of obstruction in kitchen sinks, and to prevent this pour a hot, saturated solution of sodium carbonate into the pipe once or twice a week. Do not allow the solution to come in contact with the enamel of the sink, for it will soon roughen it. The causes of obstruction in toilets are many, for, unfortunately, there are more than a few people who are selfish enough to risk entailing expensive plumbing repairs in order to save themselves the trouble of walking to a garbage can or wastebasket.

The temperature of the ward and sick-room is a most important consideration. A low temperature, providing the patient's body is kept warm, will often act as a respiratory and circulatory stimulant, and patients who are restless and excited will frequently become quieted and go to sleep when they are put out of doors, even in winter. On the contrary, a hot ward at night will invariably mean restless, if not sleepless, patients. Patients with chronic diseases associated with poor circulation and anemia usually require warmer surroundings than fever patients and those in shock or under the influence of an anesthetic need, temporarily, a still warmer environment.

Room temperatures commonly advised are.—For pneumonia patients and many febrile conditions, as low a temperature as can be ordinarily obtained without having the patient in a draft; for the general ward, 68° F., during the daytime and 65° F. at night; for bathrooms,

70° F.; for treatment and recovery rooms,[1] 72° F.; for the operating room, during operations, about 78° F.

Demonstration 2

Dusting and Cleaning

Requisites for demonstration.—(1) A dusting basin containing warm water, two dusters, a cake of soap or of bon ami on a dish, or a can of bon ami powder, a wooden toothpick. (2) Floor mops and brushes and brush covers, and a vacuum cleaner, if this is used in the hospital, and any other cleaning appliance the use or care of which should be demonstrated.[2]

Points to remember.—It is most important to keep places where the sick are cared for free from dirt and dust, for this may contain material that will afford food for germs, and thus aid in the spread of infection.

Use a damp, not wet, duster when cleaning articles that will not be injured by moisture. Things that will be are: electric light fixtures, lacquered metals, surfaces colored with water paints, kalsomine, shellac, varnishes, or wax. The best thing to use for articles of this kind is a so-called "dustless-duster," though a soft dry duster may be used.

[1] Rooms in which patients are kept after operation until they regain consciousness.

[2] It should hardly be necessary to teach women how to dust, but experience shows that it is, and the rapidity with which new sinks, bath tubs, and the like are ruined in hospitals makes it evident that the majority of people know very little about the action of detergents on enamel, glass, etc. Space here will not permit of going into details further than the most essential points, but the information needed will be found in chapters xvi. and xvii. of *Physics and Chemistry for Nurses*, Pope, G. P. Putnam's Sons, and in any book of Household Chemistry.

Wash your duster whenever it is soiled and change the water in the basin as often as necessary; it is impossible to make things clean with dirty dusters or water.

Dust the higher shelves, etc., before the lower ones.

Form the habit of removing dust with one firm stroke, it is waste of time and energy to move the duster back and forth over a surface. When dusting a bar put your hand, enclosing the duster, around it.

Remove dust from cracks and crevices that are too small to put the duster in with the point of a wooden toothpick.

When dusting a bed, do not forget the bars that are out of sight.

When dusting a room after a patient has left it, do not forget the cupboard shelves, hooks and hook supports, cornices and baseboard; the bureau drawers and their supports; the roller of the window shade; the toilet utensils, the bars of the chairs and tables. Even if a maid or orderly does this work, the nurse in charge of the room is responsible for it. Form the habit of, when finishing work of this kind, looking around and assuring yourself that nothing has been forgotten.

When cleaning the **surgical dressing carriage,** be careful not to move the covers of jars containing sterile material, and *put everything back in its place.*

When cleaning the **medicine case,** only remove a few bottles at a time, so that if you are called away you will not have to leave them out of place; *never leave medicines out of the case and always lock the latter when you leave it.*[1] Put the bottles back in their place and see that those

[1] This rule has been made in hospitals because despondent patients have secured poisons from unlocked cases and committed suicide.

marked "Poison" or "For External Use" are separate from others.

Do not use strong alkaline or granular detergents for cleaning enamel or glass. Hospital sinks, bath tubs, medicine cases, and enamel utensils are frequently ruined in this way.

Use soap or bon ami for bath tubs, etc., and, if very dirty, kerosene.

A good method of cleaning the glass of dressing carriages, medicine cases, and the like, is to wipe them with a clean, damp duster; make a paste, the consistency of a thick cream, of hot water and powdered bon ami and rub this sparingly over the entire surface, let it dry, and then remove it, and polish the glass by rubbing with a clean, lintless, dry duster. This, plus a little ammonia water, is also good for cleaning nickel and aluminium. There must, however, be very little ammonia in the paste used for the latter metal, because it is ruined by alkaline and acid detergents.

Nickel may be kept bright by frequent washing with hot water and soap, and an occasional rub with a paste made of sodium bicarbonate and kerosene.

Copper and brass fixtures and utensils can be easily cleaned with a preparation made of: kerosene 1 pt., whiting 4 oz., oxalic acid 3 drachms, alcohol 4 oz.

Bon ami is one of the best detergents to use for surfaces that are painted white, but not for colored paints; for the latter dilute soapsuds made of warm water and neutral soaps, as ivory or white castile, are best, or a weak solution of ammonia water: 1 oz. ammonia (30 c.c.) to 1 quart of water (1000 c.c.)—this is also used for cleaning varnished and oiled woodwork.

Dust is never to be blown around and scattered in hospital wards or sick-rooms, and for this reason the

floors are not swept, but either cleaned with a vacuum cleaner or dusted with an o'cedar or other mop that will hold the dust, or, especially for a large ward, a damp, not wet, duster is pinned around a long brush and used in the same way as a mop, and the duster is changed as soon as it is soiled.

After use all dusters must be washed with soap and hot water and hung in the places provided for them. Mops and brooms should be hung up and not allowed to stand on the floor. O'cedar mops can be easily cleaned when necessary by soaking them in kerosene and then washing them with hot soda water. When they are dry, they will need an application of polishing oil, only a small amount of this should be put on at a time.

Bed pans must be thoroughly cleaned after use, this is done by rinsing them first in cold water and then in hot water (*heat coagulates albumin which is contained in all excreta, and if hot water is used before the feces is removed it will be difficult to clean the utensil*). Also at regular stated intervals they should be thoroughly washed with tepid water and soap and then scalded or put into the utensil sterilizer.

Urinals are cared for in the same manner as bed pans and in addition they are washed about once in every two weeks with a 6 per cent hydrochloric acid solution. This consists of 1 oz. of HCl to 1 pt. of water (30 c.c. to 500 c.c.).

Methods of Removing Stains from Linen, etc.

To maintain a neat appearance in hospital wards and rooms without undue expense it is most important that the bed and toilet linen be kept free from stains, and, if this is to be done, anything that becomes stained must at once be put into warm (not hot) water, and left in it

until there is time to eradicate the stain. The stains most frequently made on hospital linen are with ink, iodine, permanganate of potash, silver nitrate, and vaseline.

Easy methods of removing these are as follows[1]:

Ink.—Cover the spot with lemon juice and add salt; put the material in the sunlight. When the lemon juice dries wash the stained part with warm water and soap, if the stain has not disappeared, make another application of lemon juice, etc., and repeat the process.

Iodine.—Wash the spot with ammonia and hot water.

Permanganate of Potash.—Wash the stained part with (a) a solution of oxalic acid; (b) ammonia water; (c) clear water.

Silver Nitrate.—Cover the spot with tincture of iodine, let this stand for a few minutes, and then wash the part with (a) ammonia water; (b) clear hot water.

Vasoline.—Wash the spot with (a) kerosene; (b) soap and hot water.

Stains on **metal** made with **bichlorid and iodine** can be removed with Universal Metal Polish (made by Borsum Bros., N. Y.), and U. S. Infallible Metal Polish (made by Hoffman, Indianapolis, Ind.).

Rust stains on **iron and steel** can be removed with kerosene and by scrubbing with sweet oil and emery powder. If the rust is not removed cover it with oil and, after about 24 hours, repeat the scrubbing. Kerosene is inflammable and therefore should not be used on a stove near the time at which it will be lighted.

Rust and many stains can be removed from **enamel and granite utensils** by washing them with: (a) kerosene; (b) hot water and soap. **Burnt material** can be removed from enamel by washing it with a soda solution made of

[1] In all instances the material is to be wet with warm water when the eradicating agent is applied.

1 pound of sal soda to 1 quart of water. The enamel of such utensils is easily cracked by knocks, by allowing the utensils to remain over a flame when they are empty or approximately so, by the use of strong alkaline detergents. When the enamel is cracked, the utensils rust very readily. To prevent rusting the utensils should be dried before being put away.

If alcohol is spilled on a surface painted with white enamel, pour oil over it before attempting to wipe up the alcohol, as, otherwise, the enamel, being soluble in alcohol, will be removed.

White stains on colored wood, such as are made by putting hot articles on them, can often be removed by rubbing with a mixture of equal parts oil and alcohol, or of oil and turpentine, or by rubbing with: (a) camphor and (b) equal parts of oil and turpentine.

Grease stains can be removed from unpainted wood by applying sal soda dissolved in cold water and later washing this off with hot water and soap powder.

To remove **ink stains from wood,** apply an absorbent (such as starch or shredded blotting paper) as soon as the ink is spilled and, after no more ink is absorbed, rub the spots with either lemon pulp, Javelle water or common salt.

Demonstration 3

Care, Cleaning, and Disinfection of Instruments and Rubber Utensils after Use

Aims.—(1) to make instruments, etc., clean; (2) to prevent metal implements rusting and (3) sharp instruments becoming blunted; (4) to avoid breaking glass utensils; (5) to preclude the deterioration of rubber implements.

Requisites for demonstration.—Samples of the instruments, syringes, and the like that junior nurses will be called upon to clean.[1]

Procedure in cleaning and sterilizing instruments.—1. Separate the sharp and blunt instruments if they are together.

2. Count them.[2]

3. Open or unclasp jointed instruments, and pull out the pistons of syringes.

4. Rinse them in cold water until all blood and discharge is removed.[3]

5. Sterilize them as described later, taking all the precautions mentioned.

6. Scrub them as described, page 42.

7. Rinse them in clear hot water and then *dry them thoroughly*.

8. Put those that have been unclasped together.

9. If there are any that are only infrequently used rub them with oil; this will keep them from rusting.

10. Unless a rack that will keep them from coming in contact with anything is provided for sharp instruments, protect their points with a cot of absorbent cotton.

11. Put them away, and count them to see that the supply is intact.

[1] It is the disinfection of instruments, etc., after use that is considered here; the preparation of these things for dressings and treatments is described in Chapter VII.

[2] Instruments are frequently lost or ruined by being thrown into the bag with soiled dressings or by being gathered up with dressing towels and sent to the laundry.

[3] Blood, pus, and other body discharges contain albumin which is hardened by heat, and thus, unless removed before the instruments are sterilized, it will become so adherent that it will be difficult to remove.

Details of Procedure

To sterilize instruments.—Blunt ones are boiled in a 1 per cent.[1] sodium carbonate solution for, in some hospitals, five and, in others, ten minutes; scissors and needles and, sometimes, knives are boiled for three minutes, but as boiling, even with care, blunts the cutting edge of instruments, knives, which are easily rendered sterile if they are very well scrubbed, are sometimes disinfected by letting them stand in a disinfectant, such as alcohol 75 per cent. or lysol 1:200, or formaldehyde 4 per cent., for thirty minutes; there are also certain articles, such as cystoscopes, thermometers, and some suction pumps and syringes that are ruined by boiling, and these also are sterilized in this way, or, in the case of suction pumps that are ruined if alcohol or water gets into their valves, by wrapping them in gauze wet with lysol or other disinfectant[2] and keeping this wet for at least thirty minutes. When syringes are disinfected as described above the barrel must be filled with the disinfectant.

Points of special importance to remember when sterilizing instruments are:

1. Sharp instruments are not to be sterilized with others.

2. Unless the sterilizer tray is provided with a support for scalpels, bistouries, and needles, protect the points of the instruments with absorbent cotton and of the hollow needles by laying the needles on a gauze compress, and, if necessary, to hold them in place, run wires through the gauze and over the needles; suture needles can be run

[1] Sodium carbonate inhibits the blunting and rusting of instruments by sterilization and assists in their disinfection.

[2] Bichlorid of mercury must never be used, for it discolors metal.

through the gauze, but doing this often dulls the fine points of the hollow ones.

3. Lay all instruments on the tray with their blunter ends in the same direction and, when lowering the tray into the sterilizer, hold it either absolutely flat or with the blunt ends of the instruments downward.

4. Do not put the instruments into the sterilizer until the water is boiling and the soda has been added.

5. Never allow sharp instruments to remain in the water one second longer than the stated time.

6. Put glass articles, as catheters, syringes, and nozzles into the sterilizer while the water is cold. Boil them for five minutes.

For methods of sterilizing rubber articles see page 45.

Wash glass utensils with (a) warm water and soap, (b) hot water.

Scrub metal instruments on the board kept for the purpose with a cork or, except the cutting points of knives and scissors, a soft brush. Either bon ami, sapolio, or emery can be used as a detergent. If any of the instruments are rusty, soaking them in kerosene before scrubbing them will facilitate the removal of the rust. Be sure and remove all trace of the detergents in the subsequent rinsing.

Dry the instruments most carefully; this, except the interior of the needles and canulas, is generally done with gauze or soft muslin.[1] It is well before starting to dry the interior of hollow needles to attach them to a syringe and alternately draw and expel alcohol or ether[2] into and

[1] The gauze or muslin used for this purpose is not to be thrown away.

[2] The alcohol or ether can be kept in a small covered jar or wide-mouthed bottle and drawn from this and returned to it from the syringe.

from them three or four times. Dry them by alternately inserting and removing their wires until the latter are perfectly dry when removed; dry the wire each time it is removed. When a needle is thoroughly dry insert the wire and see that it extends as far as possible beyond the point of the needle, as this will help to protect the latter. Treat canulas in the same way as needles, using the trocars instead of wires.

To clean and disinfect rubber gloves, wash them in cold water. Boil them for two minutes.

Wash them on both sides with warm water and soap.

Fill each one in turn with water, or else inflate it with air, to see if there are any holes; put aside those which have holes.

Dry all the gloves thoroughly, but keep those with holes separate; dry each one first on the outside, and then, after turning it, the inside.

It is a common custom in hospitals to have the gloves sterilized after they have been cleaned, so that they will be ready for use when needed, and the following method of doing this is one very commonly used:

Powder them inside and out with sterile talcum powder.

Fold the wrist of each glove outward so as to form a cuff.[1]

Encase each pair with a little package of talcum powder[2] in a muslin folder.

These packages are sterilized in the autoclave for ten minutes at fifteen pounds pressure.

[1] Folding the wrist of the glove in this way makes it possible to put on the glove without touching the outside.

[2] The powder used for this purpose is rolled in paper and sterilized in the autoclave for thirty minutes. The packages are kept in sterilized containers until needed.

To repair gloves with holes.—Put each glove in turn on the form provided for the purpose and paste a small piece cut from a discarded[1] glove over the holes. After the cement is dry, balloon[2] the gloves with air to ascertain if the patches are firm.

Proper care of rubber appliances is very essential, for they are expensive and easily ruined, especially by heat, moisture, oil, acid, and alkalies; also they are easily scratched by granular or rough substances, and readily cracked, torn, and punctured.

Therefore, soiled rubber appliances must be always well and carefully cleaned after use; if they are sterilized, they must not be left in the boiling water longer than necessary (this is usually five minutes), they must not be sterilized with instruments, both because these may puncture the rubber and because the sodium carbonate injures it; and they must be very carefully dried before they are put away. Stomach tubes, rectal tubes, and catheters are always sterilized after use. Rubber dressing sheets as a rule are only sterilized after use for a patient with a septic wound or an infectious disease, and in such case, except when there is a virulent infection, they are often disinfected (instead of being sterilized) by soaking them in formaldehyde 2 per cent.,[3] or carbolic 1:40, or some equally efficient disinfectant,[4] for from two to six hours according to the nature of the infection. Hot-water bags and ice-caps are treated in the same way as rubber sheets.

[1] All gloves that are too torn to be mended are kept for this purpose.

[2] Shake the glove until its sides are separated and the glove filled with air, and then hold the wrist with the opening closed.

[3] When formaldehyde is used the container must be kept covered.

[4] Bichlorid of mercury should not be used if there is any metal on the article nor for white rubber. For reasons, see Bacteriology.

Some important points to observe in the cleaning and care of rubber articles are as follows: If the soiling matter consists of any substance that contains protein, as blood, pus, serous fluid aspirated from cavities, fecal matter, urine, the appliance must be rinsed with cold water as soon as possible, for if such soil is allowed to dry upon the rubber or if the article is put into hot water the soil may become so hardened that its removal will cause a break in the rubber.

Most rubber appliances are best cleaned by scrubbing them with a soft brush and soap or lysol solution and warm water and then rinsing them in clear warm water. They should be wiped as dry as possible with a towel, and then, if possible, hung up until they are perfectly dry.

Rubber sheets will wear better if they are kept hanging over a bar, instead of being folded; if, however, they must be folded, the folds should be as large as the space in which the sheets are kept will permit, and nothing heavy is to be put on top of them.

Rubber tubes, such as lavage and rectal tubes and catheters, should be, after use, held under the cold water faucet of the hopper and the water allowed to run through and over them until all soil is removed. They are then rolled in gauze and sterilized for five minutes; the water should be boiling when they are put in, and they should be removed as soon as the time has expired.

Wash them as described above; dry their exteriors with a towel and their interiors by stretching and squeezing the tubes and wiping off the drops of water that appear at the open ends; continue the process until there is no more moisture visible. This is most important, for if water remains in a tube it will soon be rotted. Such tubes will last longer if they are kept where they can lie

perfectly flat than if they are coiled. If they are coiled, however, the coil must be very loose, as any compression tends to crack the rubber. Gastric lavage tubes are to be kept separate from any other tubes and also rubber catheters that are used for catheterizing. There should be some mark to distinguish catheters used for this purpose from those used for rectal treatments.

The tubing of irrigators, douche cans, and the like should hang with the stop-cock open, so that it can drain, and not be coiled (as is very commonly done) within the utensil, for if such tubing is coiled its interior remains moist, and this will cause it to rot and small particles of rubber may then be washed into wounds.

To dry the interior of an ice-cap, after draining out all the water, put a dressing towel into the cap and let it remain for a short time to absorb the moisture; then let the cap stand for a while with the cover off and its walls pulled up so that they will be held apart with air. Dry and put away the cover as soon as the use of a cap is discontinued, otherwise it or its washer is likely to be lost. When the cap is dry put on the cover, keeping enough air in the cap to prevent its sides coming in contact. This must always be prevented with caps and similar appliances, for otherwise, if the rubber is at all moist, the sides may adhere. When inflated with air in this way caps can be very easily punctured and therefore they must be kept in a drawer or box by themselves.

To dry the interior of hot-water bottles hang them open end downward with their stoppers out, but attached to the handles with a chain or string. Hot-water bags that are in frequent use are generally kept hanging in this way when not required, but, should they be put away, they must be inflated with air in the same manner as ice-caps.

Rubber articles that are not used frequently will last longer if they are covered with talcum powder.

Hard rubber articles are cleaned in the same way as those of soft rubber, but, as they are softened more or less by boiling, they are usually disinfected in the manner described on page 41.

Silk catheters are cleaned in the same way as rubber ones, but they need special care in their sterilization. They must be boiled in just enough water to cover them so that they will not float and come in contact with each other (nothing else should be in the sterilizer at the time), but they must be kept covered with boiling water during the process. They must on no account be put into the sterilizer until the water is boiling and must be removed the minute the required time—five minutes—is up.

CHAPTER IV

Bed-Making

How to strip, air, and clean a bed. Principles of bed-making. Methods of making: a closed bed, an anesthetic bed, a fracture bed, a bed with a patient in it. Methods of moving a patient when: making bed, turning pillows, changing nightgown, changing and turning mattress.

Demonstration 4

How to Strip and Air a Bed

Requisites.—A made bed; 2 chairs, a table.

The important points to be considered are:

To save time and energy by doing the work in an order that will entail going around the bed as seldom as possible.

To so arrange the clothes after they have been removed from the bed that they will be all exposed to the air.

Not to soil clothes by dragging them on the floor.

Procedure.—Remove everything from the bedside table and place two chairs back to back two or three feet apart.

Place the pillows upon the table or the seats of the chairs.

Fold the spread in its creases and hang it where it will not get crushed.

Loosen the clothes all around the bed. To do this raise the edges of the mattress by passing one hand along under it, and draw out the clothes with the other hand.

Remove the clothes, one at a time, taking hold of each article in the center (this will prevent their ends dragging on the floor), and place them over the back of the chairs. Hang the rubber sheet, if one is used over a bar of the bed.

Turn the mattress over from top to bottom[1] and stand it, arched, on its upper and lower ends. The bed should air for at least twenty minutes.

Demonstration 5

To Air and Clean a Bed after the Discharge of a Patient

Requisites.—Whisk, skewer or thin strip of wood with a small piece of absorbent cotton wound around one end, newspapers or an old rubber to protect the floor, bon ami, a pail or basin of warm water, and, sometimes, a basin containing a disinfectant.

Procedures.—If the patient has had an infectious disease the bedding is usually fumigated or disinfected or, especially in the home, after non-virulent infections, exposed to the air and sunlight for several hours. Otherwise proceed as follows:

1. Put paper or rubber on the floor under and around the bed.

2. Loosen the clothes as described in the preceding demonstration.

3. Fold the linen and pile it together or else put it directly into the clothes hamper.

[1] The mattress should not be turned from side to side for, if it is, the same part will again bear the heaviest weight and the mattress become dented sooner than it would if properly cared for.

4. Hang the blankets over the backs of chairs (it is better, when possible, to use other blankets when making the bed so that those which have been in use may have a longer time to air).

5. If possible, a fresh rubber sheet should be used and the one on the bed removed and later thoroughly scrubbed and disinfected, but if it has to be used before it can be so treated, spread it on top of the mattress and wash it with a duster moistened with a disinfectant, lysol, about 3 per cent., being a good one to use, as it is a detergent, and then hang the rubber over a bar of the bed to dry. Whisk the mattress thoroughly, paying special attention to tufts and seams, and do not forget the sides, top, or bottom; stand it, arched, on its ends to air.

6. Whisk the pillows and springs of the bed.

7. Wash the bed with warm water and bon ami, using the covered skewer to clean crevices and, if there are any, the spirals at the top and foot of the bed. Do not forget the bars and the under surfaces of the springs.

In some hospitals, the mattress and pillows are whisked and the bed, following the use of bon ami and water, washed with a disinfectant, usually formaldehyde, but it must be appreciated that such treatment cannot be relied upon to kill either germs or vermin, since the bedding is not sufficiently saturated with, nor exposed long enough to the influence of, the disinfectant.

8. Leave the bed, etc., to air and dry. If they are in a room, open the windows; if in a ward, put the pillows on the springs and the blankets over the head of the bed, and, if the bed cannot be put out of doors, place a screen around it; if it can be put outside pin the blankets to keep them from being blown down.

Principles of Bed-Making

The exact methods of making beds differ somewhat in different hospitals, but **the fundamental principles** are the same and are always to be considered when making beds for the occupancy of a sick person. They are:

1. The mattress must be protected.

2. The sheets under the patient are to be so fixed that they will remain without wrinkles.

3. The upper clothes on a "closed bed" should be so arranged that they can be turned down when the bed is opened without disturbing the under sheets.

4. The upper clothes must not be too tight over the patient's feet.

5. Loss of time and energy are to be avoided.

6. The bed must look neat and, in a ward, all the beds should look uniform, because uniformity is necessary for a neat appearance, and the maintaining of a neat appearance is an essential element in promoting cleanliness.

7. Keep the surroundings neat while you work, and do not consider your work with the bed finished until you have put the chairs and table in place, removed everything that should not be left on the table, and, in the ward, if there is a window near the bed, seen that its blind is straight.

The ways of complying with these principles are as follows:

1. The mattress is covered with either (a) a snugly fitting, washable cover, which is usually made of plain ticking or heavy unbleached muslin, (b) a cotton quilted pad, or (c) a rubber sheet. When either b or c are used, there is usually a buttonhole in each corner and buttons

on the corners of the mattress. In addition, for the better protection of the mattress, while it is necessary for the patient to use the bedpan, a rubber sheet or a quilted pad three to four inches narrower than the draw sheet, but long enough to tuck under the mattress at the sides, is put under the draw sheet. When a rubber sheet is used the draw sheet should be double or else the rubber should be covered with a pad.

N. B. *Rubber sheets with holes in them, even very small holes, are about useless.*

2. To keep the under sheets free from wrinkles, they must be (a) put on perfectly straight, otherwise the material is, as it were, on the bias, and if the sheet becomes at all loosened it will wrinkle; also, when making the bed with a patient in it, unless the sheet is perfectly straight when it is passed under her, it will be impossible to free it from wrinkles, for pulling the biased material will cause wrinkles. (b) The sheets must be stretched tightly and (c) the ends tucked under the mattress to the center line so that the patient's weight will be over them and help to keep them in place.

3. If the upper sheet and blankets are tucked under the mattress along the sides, they should not be put as far under as the lower sheets or the latter will be pulled out when the bed is opened. The advantage of allowing the upper covers to hang at the sides is that the bed can be opened quickly when, for example, a new patient is brought in, while the advantage of tucking in the upper sheet and blanket is that the bed can be made to look firmer and neater.

4. Have everything needed for the work at hand before beginning and do the work in the order that will necessitate going around the bed as seldom as possible.

FIG. 2.—MITERING A CORNER OF THE UNDER SHEETS.

Demonstration 6

To Make a Closed Bed

1. Adjust the protector.

2. Cover this with a sheet. Let the latter extend about eighteen inches beyond the mattress at the top to allow for tucking in. Be sure that the sheet is straight and leave exactly the same length on each side. There are two methods of arranging the under sheet in common use, in one the corners of the sheet are mitered on the side, in the other the miters are made at the top and bottom. When the first method is used, tuck the sheet under the mattress at the top and bottom, miter, *i. e.*, fold like an envelope, the upper and lower corners on the side at which you are standing and then tuck in the sheet on this side. For the second method tuck the sheet under the mattress at the side only and without making the miters.

3. Put on the second protector, placing it where the patient's buttocks and thighs will rest. Tuck it in on the side at which you are standing.

4. Cover this with the draw sheet.[1] Leave the latter a little longer on the side at which you are standing than the other. Tuck it in on this side. It should extend from slightly under the pillow to about the level of the patient's knees and at least two inches beyond the top and bottom of the upper protector.

[1] The draw sheet is so called because a part is supposed to be drawn from one side to the other when the sheet under the patient gets warm, so that a cool place can be provided for her to lie on. In some hospitals special sheets are provided for the purpose; when this is not the case, it is generally necessary to put the sheet with the length across the bed, for the width of the ordinary sheet is seldom sufficient to allow of it being drawn back and forth as required.

5. Go to the opposite side of the bed. Turn back the draw sheet and protector so that they will be out of your way and then stretch and tuck in the under sheet in the same way as on the other side. If the sheet is arranged according to method 2, after tucking in the sheet on the side, go to the head of the bed, miter the sheet at the top of the mattress and tuck it under; go to the foot and, after stretching the sheet firmly, arrange it in the same manner as at the top.

6. Stretch the protector firmly and tuck it under the mattress.

7. Ditto the draw sheet.

8. Put on the top sheet with the hem wrong side up, so that the right side will be uppermost when the sheet is turned over the blanket, let it extend about three inches beyond the rim of the mattress at the top, tuck it under the mattress at the bottom. It is sometimes allowed to hang at the sides, if this is not the case miter the lower corners and tuck the sides under the mattress, stretch it before tucking it in on the second side.

9. Arrange the blankets. The method of doing this varies. If the upper covers are allowed to hang at the sides, place the blankets so that their upper edge is within about 6 inches of the top of the mattress, tuck the lower end under the mattress, turn the upper edge of the sheet over the top of the blankets and do nothing further until the spread is in place.

If the sides of the blankets are not allowed to hang:

Put on one blanket with its upper edge within six inches of the top of the mattress, fold it back under itself at the bottom, tuck it in on the sides, but before tucking in the second side, stretch the blanket tightly, for it is largely upon the tautness of this blanket that the good appearance of the bed depends.

FIG. 3.—METHOD OF ADJUSTING THE UNDER SHEET TIGHTLY WHEN THE CORNERS ARE MITERED AT THE FOOT, INSTEAD OF THE SIDES OF THE MATTRESS.

Put on the second blanket, fold the sides under the body of the blanket[1] along the sides; tuck it under the mattress at the bottom. Turn the upper edge of the sheet over the blankets.

10. Put on the spread evenly, with its upper edge on a line with the top of the mattress. Tuck it in at the bottom. If the blankets have not been tucked in on the sides arrange them and the spread so that they fall in a

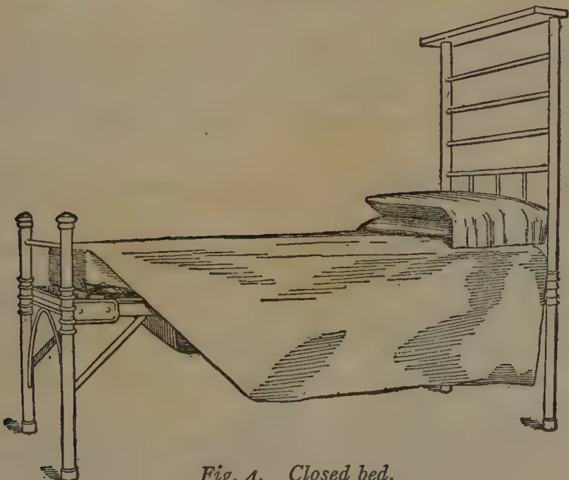

Fig. 4. Closed bed.

sharp, straight fold on a line with the corner of the mattress. If the blankets have been arranged according to the second method, miter the corners of the spread at the side, and tuck in the under part of the folds of the miters, but allow the sides to hang as in Fig. 4 or else perfectly straight.

If necessary, put clean cases on the pillows; shake

[1] Folding the blankets in this way makes a sharp edge around the bed and helps to give it a neat and finished appearance.

them; get their corners into those of the cases; press them on a table until they are perfectly flat. Place them on the bed. Their arrangement on the bed differs in different hospitals; the main point is that in a ward it should be the same on all the beds.

Demonstration 7

An Anesthetic Bed

Aims.—(1) To have the bed so made that the patient can be placed in it quickly. (2) To provide external heat in order to prevent shock or to assist in recovery from shock.

The principal points to be considered in making an anesthetic bed are:

1. The mattress is to be particularly well protected (*the rubber sheets should be examined to see that they are without the slightest suspicion of holes*) and pillows are to be covered with rubber cases put on under the white ones.

2. The bed is to be thoroughly warmed and extra blankets provided.

3. The bed and its covers are to be so arranged that there need be no delay in putting the patient into it when she is brought from the operating room.

4. Nothing (*e. g.*, table or chair) is to be left where it will be in the way of the stretcher or of those lifting the patient from it.

5. All the articles required if the patient vomits or is in poor condition are to be placed where they can be reached instantly.

6. **Care necessary in filling hot-water bags.**—Remove the stopper and roll the bag from the bottom upward so as to expel the air; otherwise the hot water is

likely to spurt over your hands while you are filling the bag, being forced out by the expanding air.[1]

Do not use water hotter than 170° F.

Do not fill a bag to its full capacity.

After inserting the stopper, hold the bag upside down for a few seconds to ascertain if there is leaking; this most frequently occurs around the stopper as the result of absent or defective washers.

Put the hot-water bag in a flannel bag, stopper first, so that if the protector becomes loosened the metal stopper will not come near the patient, for, as metal absorbs and parts with heat more readily than rubber, it is more likely to cause a burn.

The reason for these precautions will be seen in Demonstration 13.

Requisites.—(1) Three sheets; (2) two woolen blankets; (3) two bath blankets; (4) ether rubber;[2] (5) an ether slip,[3] or an extra sheet; (6) a pillow or pillows (*the number needed will depend upon the position in which the patient is to be placed, if only one is used for standing at the head of the bed, it should if possible be a hard one*); (7) a rubber and a linen case for each pillow; (8) two dressing towels; (9) a nightgown; (10) three hot-water bags; (11) the articles needed if the patient vomits or clenches her teeth, viz., kidney-basin, mouth wipes,[4] a small paper

[1] Why will the air in the bag expand when hot water is put into the latter?

[2] A strip of rubber the width of the bed and about sixteen inches long, unless the rubber under the draw sheet is narrow, when it must be longer, for the two rubbers must meet and the ether rubber extend to the top of the mattress and the other one to the level of the patient's knees.

[3] A hemmed strip of white muslin about two yards wide and one yard long.

[4] Pieces of gauze or of tissue or crêpe paper about three inches square.

bag for soiled wipes, a wooden tongue depressor or mouth gag; (12) a bandage; (13) shock-blocks or whatever the institution provides to raise the foot of the bed when the patient is in a bad condition and the head of the bed for Fowler's position.

Procedure.—The details of the preparation of beds for anesthetized patients vary considerably, but two methods that are very commonly used are as follows:

Method 1.—Arrange the protector, under sheet, rubber, and draw sheet as when making a closed bed.

Put a bath blanket lengthwise across the bed with its lower edge across the foot of the mattress. Tuck it in on both sides.

Place the ether rubber across the head of the mattress. Cover this with the ether slip or a folded sheet (this should cover about eighteen inches of the mattress and extend an equal length beyond it at the top), tuck it in on both sides, and with mitered corners at the top.

Put a bath blanket, the upper sheet, the two bed blankets and the spread in the usual position, but do not tuck them in. At the top, turn the spread over the blankets and the sheet over the spread in the usual manner. Turn the lower edge of the upper bath blanket over the upper covers at the bottom and make a nine-inch fold of these across the lower edge of the mattress. Make a neat nine-inch fold of all these covers on the side of the bed to which the stretcher will be brought (*this arrangement is to facilitate the quick turning back of the covers to the far side as soon as the patient arrives*).

Put three hot-water bags under the top covers, one near the head of the bed, where the patient's shoulders will rest, one in the center, and one at the foot. Put a nightgown over one of the bags so that it will be warmed and ready for use if required.

Arrange the pillows, the various methods of doing so will be described after Method 2.

Cover one half of the table with a folded towel and on this place the kidney-basin, towel, mouth wipes, etc. Place the table where it will be out of the way of the stretcher. Pin the paper bag to the sheet at the head of the bed.

Place the shock-blocks near the foot of the bed or, if the patient is to be placed in the prone or Fowler's position, the head.

Method 2.—The only differences between methods 1 and 2 is the arrangement of the bath-blankets, and the upper covers; therefore, arrange the underclothes as far as, and including, the draw sheet, as in Method 1, also the ether rubber and slip[1] and the upper covers, except the bath-blanket, but tuck the covers in at the foot of the bed.

Turn down the upper covers in a nine-inch fold at the foot of the bed, then double both of the bath-blankets and place them so that one will cover the upper and the other the lower half of the bed. Put one hot-water bag near the top of the bed, one in the center of the upper blanket and the other, near the bottom of the lower blanket. Put the nightgown over one of the bags. Turn up the sides of the bath-blankets so that the edges lap down the center.[2] As will be seen in Demonstration 14, when the

[1] If the patient is to be placed in the prone position it will be better to arrange these blankets so that the opening will be on one side, instead of in the center, preferably the side of which the stretcher will be brought.

[2] Even when the patient is to have a pillow or pillows under her head it is well to use the ether rubber and slip, because if she is in poor condition or very nauseated it may be necessary to remove the pillows.

patient is put into bed, the upper blanket is wrapped around the trunk and the lower one around the legs.

The manner of arranging the pillows will depend upon the position in which the patient is to be placed, and this will be governed by either the condition of the patient or the nature of the operation. Sometimes after operations upon the brain or skull the patient is put in what is known *as Fowler's position in order to limit oozing; this position is also often used after operations upon the chest to facilitate drainage, and either it or what are known as the prone position and the lateral position is used after operations for septic conditions of the abdomen. If the patient is suffering from shock,*[1] *she is placed on her back without any pillow under her head and the foot of the bed is raised in order to favor the flow of blood to the brain. When there is no need for any of the positions mentioned, the patient is placed either with one pillow under her head, or a common custom is to leave the pillow out until the patient recovers consciousness and then, if she is in good condition and desires it, give her one. The main reason for the omission of the pillow is to favor the flow of blood to the brain.*

When a pillow is not put under the head it is usual to stand a firm one at the head of the bed to prevent the patient knocking her head against the bars. This is particularly necessary when the foot of the bed is raised. To keep the pillow in place either (1) tie it in place with a piece of bandage; (2) pin the case over a bar of the bed as in Fig. 5, or if there is no horizontal bar, or the pillow-case is not wide enough to be so pinned, envelop the pillow in an ether slip or draw sheet, stand the pillow in position and pin the side ends of the slip together at the back of the bed.

A pillow is sometimes placed lengthwise at one side

[1] See Chapter VIII.

of the upper part of the bed, with the opening of the case toward the foot. This is to put behind the patient's head and slightly under one of her shoulders, so as to help to

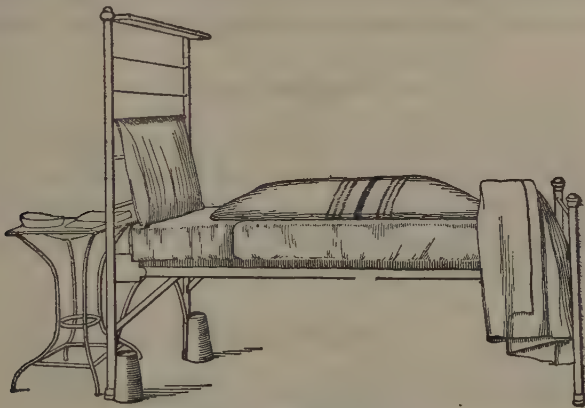

Fig. 5. Anesthetic bed.

keep her head turned on one side. The reason for this will be found in Demonstration 14. It can be used either with or without a pillow under the head. In the former case put a portion of the lengthwise pillow under one side of that intended for the head.

The arrangement of the pillows for the prone position in which, as the name signifies, the patient lies prone, consists in placing one pillow where her head will rest and the other where it will be under the lower part of her chest (not the abdomen). If the bed has been made according to Method 1, place the pillow for the chest between the two bath-blankets; if according to Method 2, under the blanket covering the upper half of the bed.

For Fowler's position the pillows are not put in place until the patient is in bed; therefore the description of

their arrangement will be left until Demonstration 14. In actual practice, however, twine and the appliances necessary to prevent the patient slipping down in bed (see Demonstration 13) must be brought to the bedside and piled in convenient order as soon as the bed is made.

Fracture Bed

The only difference between a **fracture bed** and an ordinary bed is that a perforated board the size of the wire foundation is placed over the latter in order to prevent any motion at the point of fracture by sagging of the mattress.

Demonstration 8

Making a Bed With a Patient in it, Including Washing and Rubbing the Back

Aims.—(1) To change the linen and make the bed in a manner to disturb the patient as little as possible. (2) To draw and fix the bedding under the patient very firmly so that it will not wrinkle. (3) To remove crumbs from the bed. (4) To make the patient comfortable.

Requisites.—(1) A dressing basket[1]; (2) a dressing basin containing warm water; (3) a washcloth; (4) a towel; (5) 2 large sheets; (6) a draw sheet; (7) 2 pillow cases; (8) a nightgown; (9) a subject, a Chase doll can

[1] A dressing basket usually contains: Alcohol or other bathing lotion, a dredge of talcum powder, a tube of tooth paste, a bottle of mouth wash, a small cup or glass, wooden applicators covered at one end with absorbent cotton (used for cleaning the teeth and mouth), small paper bags for the reception of soiled mouth-wipes, nail brush, nail file, orange sticks, soap, comb, whisk, dressing rubber, and, in hospitals where its use is frequently required, a small bottle of delphine.

be used for the purpose, but it is better for the pupils to take turn "being patient."

It is well for the pupils to become fairly expert in carrying out the more difficult procedures involved in making a bed with a patient in it before attempting to make the bed and therefore these will be described first.

To move a helpless patient to one side of the bed.—If alone and *the patient is small*, pass one arm under the upper part of her back and the other under her thighs and draw her toward you.

If the patient is tall, put one arm back of her neck and far shoulder and the other under the small of her back and move the upper part of the body; then slip one arm under the small of the back and the other under the knees and move the lower portion of the body. It may be necessary to repeat the procedures once or twice in order to get the patient as far over as required, but it is not essential to carry them out in the same order; in fact, it is better to move first the part of the body by which you are standing.

If the patient is very ill and heavy, assistance should be had if possible. In such case, support the patient's head and shoulders with one arm and slip the other arm under the small of her back. Have your assistant stand beside you and pass one arm under the upper part of the patient's thighs and the other under her knees. Draw the patient toward you.

To turn a patient on her side.—*To turn a weak or helpless patient toward you*, slip one arm under her far shoulder and obliquely across her back, so that your hand comes under the side nearest you; pass your other arm under her hips, also from the far side, raise her slightly, and, drawing her somewhat backward, turn her toward you. (See Fig. 6.) It may be necessary to make some

change in the position of her shoulders or hips. If so, to move her shoulders, place your arms, one on either side, around her body with your hands under her lower arm,

Fig. 6. Turning patient.

raise her slightly, and move her as required. Have the pillow under her head while doing this. The hips can be moved in the same manner.

A heavy patient is usually more easily turned by loosening the draw sheet on one side and, reaching over the patient, grasping the loosened end of the sheet on a line with the patient's shoulders and thighs, and, by pulling it upward, turn the patient.

If the patient is not helpless all that is usually necessary is to place one hand on her back between the shoulders and the other behind her thighs, passing your hands behind her on the side farthest from you and press upward.

To turn a patient from you, slip one arm under her shoulders from the near side, getting your hand as far as possible under her far side. Pass your other arm under the hips until your hand comes well under the far thigh.

Raise her somewhat and, drawing her slightly backward, turn her.

N. B. *In doing work of this kind, when necessary to bend forward, bend your knees and hips, never your back.*

To wash the back.—If possible have the patient on her side; if she is weak turn her toward you, for you can then support her with one arm while you work. Turn back the upper corner of the bedclothes enough to have them out of your way, but not enough to expose the patient unnecessarily. Protect the bed by putting a small rubber covered with a towel close to the patient. Begin the work at the neck and shoulders, wash first with soap and then with clear water; dry the parts with the towel covering the rubber.

If the patient cannot be turned on her side you should, if possible, have an assistant and make her stand on the side of the bed opposite you and, by putting her hands behind a small part of the body raise it slightly upward from the bed while you, with the moist washcloth in the center of your hand, fixed so that its ends will not drag on the bed, pass your hand under and wash as much as you can, then dry this part, rub it with alcohol and powder as described in the paragraph following. Begin to work at the shoulder nearest you and proceed in like manner until you have finished all this side of the back, then pass your assistant the necessary utensils and have her do the washing, etc., while you hold the patient. If you cannot get an assistant, raise the parts with one hand and work with the other proceeding in the manner just described.

N. B. *It is to be remembered that when a patient cannot be turned, washing and rubbing the back is even more important than when she can, as there is then often great danger of pressure sores.*

To rub the back.—Pour a little alcohol on your hand and rub it on the back around the shoulders and neck, then place your hand firmly on the skin and move the flesh on the bone, repeat until you have gone over the entire back and hips; pay special attention to any parts that look red. Pour a little powder on your hands and rub it over the back; do not use much.

To change the nightgown.—Important points to remember when doing this are:

When a patient is weak or helpless, if the sleeves of the gown do not slip off readily, slip one of your hands through an armhole, grasp the patient's arm about the elbow, and, bending it slightly, draw it backward while, with your other hand, you pull the sleeve either at the armhole or the wrist.

Get a weak patient's arm into the sleeve of a gown by putting your arm through the lower opening, grasping her hand, including her thumb, and drawing the arm through the sleeve.

If an arm is injured, remove the sleeve from that arm last, but put the sleeve of the clean gown on it first.

Be sure that the gown is well pulled down and free from creases. If the gown opens down the back, it is usually better, especially if the patient is weak or helpless, not to put the lower ends under her as they are likely to become wrinkled.

Procedures in changing the nightgown:

Method 1.—If the gown opens down the back, remove one sleeve of the gown to be discarded and put on the corresponding sleeve of the fresh one. Slip the fresh gown across the chest, under the soiled one, to prevent exposure, and change the sleeves in the same way as the first ones.

Method 2.—To remove a closed gown, have the

patient lie on her back with her knees flexed; pull the gown up as far as possible, then, if the patient is strong enough, have her raise her thighs slightly; if she is not sufficiently strong, place one of your hands under her buttocks and raise her while you draw up the gown with the other hand, raise her shoulders if necessary. When the gown has been gathered up to the shoulders, slip one of your hands through the upper armhole of one of the sleeves, grasp the patient's arm below the elbow, bend it slightly while, with the other hand, you draw off the sleeve; slip the gown over the head and off the other arm.

The best way to put on the gown depends upon its make. If it is narrow at the top and does not unbutton it can sometimes be put on most easily in about the same manner as the soiled one was removed except that the order of things is reversed; thus one arm is drawn into a sleeve, then the gown is put over the head and the other arm drawn into its sleeve and the gown pulled down, raising the patient while doing so in the same manner as when removing the gown.

Method 3.—If the gown is loose at the top and the opening is a fair size, it is best put on by gathering it up loosely and slipping it over the head and then drawing first one and then the other arm through a sleeve. The gown is pulled down as in Method 2.

To change the pillows.—Slip one arm under the patient's neck and far shoulder, letting her head rest on your arm (see Fig. 7); raise her slightly and with your free hand remove the pillows, pulling them outward. It is usually easier to remove them one at a time. Before replacing the pillows, shake them and see that their corners fit into those of the cases. Do not let them rest on the bed while doing this. To replace them, put them one on top of the other, at the head of the bed close to,

but on the far side of, the patient; raise the patient as when removing the pillows; pass your hand back of her and, taking hold of the lower pillow, draw them into

Fig. 7. Method of supporting head and shoulders while adjusting pillows, etc.

place. Arrange them so that the patient rests comfortably. Do not allow an unconscious or helpless patient's head to be thrown forward on the chest, for such a position will interfere with proper breathing.

Procedure in making the bed.—1. Place a chair or table at the foot of the bed and pile the linen upon it in the order in which it will be needed.

2. Place two chairs back to back, about two or three feet apart, in readiness to receive the clothing taken from the bed.

3. Remove the spread, fold it, and put it where it will not get crushed. If there are two blankets on the bed remove the upper one

4. Loosen the bedding all around the bed; to do this raise the mattress with one hand and draw the clothes out with the other.

5. Change the top sheet if necessary (*if it is not soiled it may be used for the under sheet or for the draw sheet if special sheets are not used for the purpose*). To change the sheet place the clean one (with the hem wrong side uppermost) over the blanket that was left on the bed, place the blanket that was removed over the sheet. Turn about ten inches of the sheet over the blanket at the top. If the patient is not too ill she can usually be asked to hold the upper edge of these, otherwise tuck them under her shoulders in order to retain them in place while you draw out the sheet and blanket that are to be removed. To remove them pass your hand under the clean sheet and, grasping them near their center, draw them out. Then separate this sheet and blanket and put them over the chairs to air.

6. Fold the sides of the top sheet and blanket up over the patient, leaving the fold just wide enough to cover her if she is turned.

7. Draw the patient to one side of the bed.[1] For methods see page 63.

8. Rub the knees, heels, and ankles with (a) alcohol; (b) powder; loosen the nightgown and, if possible, turn the patient on her side, in any case wash her back with soap and water, including the axilla, shoulders and thighs, rub these parts with (a) alcohol; (b) powder.[2] For method see page 65.

[1] When possible, this should always be done when making beds, giving baths, or other treatments the nature of which does not prohibit, for the change of position is usually agreeable to the patient and makes it less necessary for the nurse to stoop and facilitates the carrying out of many of the details of her work.

[2] These procedures should always be carried out when a patient is not able to move around freely, except when a bath has just been given; they are not always necessary for patients who are not very ill.

9. Change the nightgown if it is soiled, if not brush all crumbs from it and fasten it. For methods see page 66.

10. Take out the pillows and shake them and, if necessary change their cases. If the patient does not object to being without them leave them out until the bed is made. For method see page 67.

11. Roll the draw sheet upward close to the patient's back.

12. Ditto the protector.

13. Ditto the under sheet.

14. Gather or fanfold the clean under sheet up to about its center (let it rest on a table or chair while doing so, not on the bed), place the gathered portion next the roll of the soiled sheet. *Be sure that the sheet is perfectly straight and that you leave an equal amount to tuck in on both sides.*

15. Tuck the side of the sheet under the mattress on the side at which you are standing.

16. Tuck the rubber in on this side.

17. Treat the draw sheet in the same manner as the under sheet with the exception of leaving it somewhat longer on one side than the other.

18. Draw the patient on to the clean part of the bed and go around to the other side.

19. Take off the soiled sheets, folding the sides and the top and bottom to the center so that if there are crumbs in them they will not get on the floor.

20. Stretch the under sheet until it is perfectly free from wrinkles and then tuck the sides and ends under the mattress in the same way as when making a closed bed.

21. Treat first the protector and then the draw sheet in the same way.

Fig. 8. Changing the under sheet.

22. Arrange the pillows so that the patient lies comfortably. See page 68.

23. Arrange the upper sheet and blankets, be sure and leave them, especially the sheet, loose over the patient's feet. The upper edge of the blankets should be on a line with the patient's neck.

24. Put on the spread, turn it a few inches over the top of the blankets and turn the top of the sheet over the spread.

25. If the hair has not already been combed and brushed, put a towel under the head and do this as described in Chapter VI.

(N. B. *These details should be carried out in the order in which they are given since, if there are crumbs in the nightgown, or upper clothes, they are likely to be left in the bed if these are changed after the under sheets.*)

26. Remove the soiled clothes and appliances used for the work. Replace anything that has been moved from its regular place. Be sure that the surroundings are in order and that the patient is comfortable.

A method of changing the sheets under a patient when the latter is not to be moved.—*When it is undesirable to move a patient, it is often easier to change the bedclothes from the top downward. To do so will require two workers, who should stand one on each side of the bed, opposite each other. It is particularly important that they work in unison, one never attempting to raise the patient until the other is ready and each one moving the sheets an equal distance.*

Requisites.—One large sheet, one draw sheet.

Procedure.—Loosen the clothes and carry out all other necessary preliminaries.

Leave one pillow under the patient's head.

Draw the soiled sheet down to the lower edge of the pillow.

Gather the fresh sheet from the bottom upward, leaving enough free to cover and tuck under the top of the mattress (about eighteen inches).

Pass this sheet under the pillow from the top, see that it is perfectly straight, and tuck the end under the mattress so that the sheet will be held in place. Let the nurse whose left arm is nearest the head of the bed pass her arm under the patient's shoulders and the other nurse slip her left arm under the small of the back.

Raise the patient as much as, but no more than necessary, and with your right hands draw first the soiled and then the clean sheet down as far as the rubber. Lower the patient.

Roll the protector and draw sheet tightly to the patient's side and let each nurse grasp the roll of rubber directly opposite the other and lift together; pull down both under sheets as far as possible. Lower the patient. Repeat procedures as often as necessary until you reach the knees, then one nurse raises the legs while the other removes the soiled sheet and draws the clean one into place.

To change the draw sheet.—Gather the clean sheet loosely in the center, leaving the ends for the top and bottom free. Pass it under the small of the back. Be sure that it is straight.

Let each nurse pass her left arm under the patient's back, a slight distance apart, and raise her slightly, and then let each nurse, with her right hand, draw the soiled sheet down under the border of the clean one, secure it under the mattress so that it will not be pulled up with the clean one, and draw the latter up as far as necessary. Secure its corners under the mattress to prevent it being pulled out of place.

If possible, flex the patient's knees and let each nurse

pass her left arm under the patient's thighs, a slight distance apart and raising the patient slightly with the right hand, draw both soiled and clean sheets down as far as possible. Lower the patient. Repeat the procedure if necessary.

Let one nurse tuck in, separately, the under sheet, rubber, and draw sheet on her side and then pass her arms under the patient's back and thighs and raise her slightly and the other nurse stretch each article separately until it is free from wrinkles and tuck it under the mattress in the usual manner. Arrange the under sheet at the top and bottom.

Demonstration 9

Methods of Changing a Mattress with the Patient in Bed

There are several ways of doing this. Method 1 as here described is to be preferred when the patient is very ill, but it needs at least three people and it may require five or seven; also, it cannot be used if the bed has a high foot-piece.

Requisites.—In addition to bed and ordinary bedding a mattress and small pillow.

Method 1.—Remove the spread, fold it neatly, and hang it where it will not get crushed.

Take off the upper blanket and hang it over the back of a chair, being careful that its ends do not touch the floor.

Fold the sides of the upper sheet and remaining blanket back over the patient, turn the bottom part of this fold under her legs.

Remove the pillows and substitute a small pillow or folded sheet.

Loosen the lower sheets and bring the center of the upper edge of the under sheet over the pillow around the patient's head and its corners down with the sides. This will prevent the pillow falling out when the patient is lifted.

Roll the sides of the lower sheets, including the rubber as tightly as possible; roll side upward, until the rolls touch the patient on each side. Tie the bottom of the rolls around the patient's feet and ankles. This prevents the clothes falling and getting in the way when the patient is lifted.

Take hold of a roll close to the head and below the knees, have your assistant do likewise on the other side.

Lift the patient from the bed.

Have the second assistant pull out the mattress from the foot of the bed and shove in the fresh one. She must have the fresh mattress ready and have hold of the one that is to be removed and be ready to pull it out the instant the patient is raised.

If the patient is tall or heavy, there will have to be two or three lifters on each side of the bed.

The ordinary mattress can be changed for an air mattress in this way. The fracture-board, which it is necessary to have under the air mattress, is slipped in before the mattress.

Method 2.—Leave a pillow under the patient's head, otherwise proceed as for Method 1 as far as, but not including, rolling the under sheets to the side of the patient; have your assistant make a triangular fold in these at the top and turn them over the patient[1]; then, by pulling these sheets on your side, draw the patient toward you, to the edge of the mattress. If the patient is tall or heavy.

[1] They are turned back in this manner to keep them out of the way when the mattress is moved.

have your assistant come around and help you do this. Fold and turn the ends of the sheets on this side over the patient in the same manner as on the other side.

Go to your assistant's help and, together, draw the mattress to her side of the bed until at least half of the wire mattress is exposed.

Cover the latter with a fresh mattress; draw the patient on to this by making traction upon the under sheets. If it is necessary for your assistant to come to your help she should first place a chair or stool under the free end of the mattress, on her side.

Have your assistant remove the mattress that is to be discarded.

Place a support under the free end of the fresh mattress, go to the other side of the bed, and, with your assistant, draw the mattress into place.

Go, with your assistant, to the other side of the bed put one arm under the pillow and the other under the patient's back; have your assistant put one arm under her thighs and the other under the knees and draw the patient to the center of the bed.

If the under sheets are to be changed, arrange them on the vacant half of the mattress before drawing the patient over.

Arrange the clothes as usual.

Method 3.—When the patient is of light weight or can help herself, one nurse can easily change the mattress in much the same way as by Method 2, but with the following differences:

Place one or two heavy chairs or stools on each side of the bed.

As the patient's movements are not to be hampered do not turn the upper covers under her feet.

Instead of turning the lower sheets over the patient.

after you turn back the sides of the upper covers over her on each side, fold the sides of the lower sheets on the mattress. On the side to which you intend to draw the patient first make the fold about two inches from the edge of the mattress and, as the patient may lie on part of this fold for a short time, have it very smooth and flat; on the other side make the fold as close to the patient as possible.

Flex the patient's knees, have her place her feet and the palms of her hands firmly on the bed; put one of your arms under her head and the other under the buttocks.

Fig. 9. Changing mattress.

Have the patient raise herself and, if possible, move toward you as you draw her forward.

Go to the other side of the bed and draw the mattress until at least half of the bed springs are exposed.

Place the chairs so that they will support the free end of the mattress while you go to the other side and place as much as possible of the fresh one on the exposed springs and arrange the chairs to support the remaining portion.

Draw your patient over as before.

Go to the other side of the bed, remove the old mattress and draw the fresh one into place. Proceed as in Method 2.

Method 4.—If the patient is not able to help herself as much as required in Method 3, fold the under sheets on *both* sides as close to her as possible and draw her from one mattress to the other by making traction on the sheets. Otherwise proceed as in Method 3.

Demonstration 10

Turning the Mattress

Requisites.—Same as for Demonstration 9, but substitute three pillows for the extra mattress.

A mattress can be turned in the same way as it is changed with the following exceptions:

In **Method 1,** after raising the patient and removing the mattress turn it and slide in first the part that was formerly at the foot of the bed.

In **Methods 2 and 3,** after drawing the mattress to one side of the bed, cover the exposed springs with three pillows and draw the patient on to these. Then turn the mattress, *turn it from top to bottom*, for the patient may fear that it will fall upon her if it is turned from bottom to top. After drawing the patient on to the mattress, remove the pillows, draw the mattress into place. and proceed as when changing the mattress.

CHAPTER V

Moving, Lifting, and Carrying Patients

Important points to be considered in moving, lifting, and carrying patients. Moving a patient up in bed. Lifting a patient into a sitting position in bed. Lifting a patient from a stretcher to the bed and vice versa. Arrangement of an anesthetized patient in bed. Fowler's prone and lateral positions. Moving a patient from one bed to another. Carrying a patient. Lifting a patient from the bed to a chair and vice versa.

Aims.—To move, lift, and carry patients in a manner that will be comfortable for them and will not strain the worker's back.

Important Points to Consider when Moving, Lifting, and Carrying Patients:

1. Before lifting a patient from the bed draw her to the edge in order to minimize the necessary degree of stooping.

2. When stooping is unavoidable, bend the knees and hips and keep the shoulders thrown back; *do not bend the back, especially when you have a weight on your arms.*

3. When lifting or carrying a patient do not let her put her arms around your neck, but have her put them across your chest and back (under your arm nearest her) and clasp her hands on your far shoulder. More weight is thus thrown on your shoulder and less upon

your back—the shoulders are not easily strained by a weight and the back is.

4. Before lifting a conscious patient, tell her to hold herself as stiffly as possible while you are lifting and carrying her.

5. Before moving a patient be sure that there is nothing to impede her movements; fold the bed and body clothes so that she will not be hampered by them.

6. If a patient is to be carried, before lifting her, see that there is no obstruction between you and your goal.

7. When lifting a patient have your hands extend well up on her far side so that she will feel well supported and give the best support to the heaviest parts of the body.

8. When two or more persons are lifting or carrying a patient they must lift in unison, and in order that they may do so one must take command, giving directions and the word to lift and to start when *all* are ready.

9. When two or more persons are carrying a patient in their arms they should step in unison, but not with the same foot; *i. e.*, when one steps with the right foot her neighbor should step with the left.

Demonstration 11

To Move a Patient up in Bed

Method 1.—Flex the patient's knees so that her feet will rest firmly on the bed. Pass one of your arms behind her and, supporting her head in the bend of your elbow, grasp her under her far arm. Put your other arm under her thighs.

If the bed is supplied with a pulley, have the patient grasp this: if it is not, have her place her hands, palms

downward, firmly on the bed and, in either case, have her raise herself slightly and push with her feet while you draw her upward.

Method 2.—If the patient is heavy and cannot help herself it will require two nurses to move her and, unless the bed is a wide one, it is better to stand on opposite sides.

If possible, flex the patient's knees, even though she cannot help herself; grasp her under the far arm as when lifting her alone and place your other arm under her back. Have your assistant place one of her arms near yours and the other under the patient's thighs or, if the latter's knees are not flexed, under them.

When you are both ready let the one in charge give command and then, together, raise the patient slightly from the bed and move her upward.

Method 3.—Loosen the draw sheet and, if the patient is heavy, the rubber. Roll these to the patient's side. Take hold of the roll about on a line with her shoulders and thighs; have your assistant do likewise on the other side, taking hold of the roll directly opposite you. Move the stretcher thus made, and with it the patient, upward.

If necessary, draw the sheet down afterward in the following manner:

Pass your arm nearest the head of the bed under the patient's back, while your assistant, from the opposite side, does likewise a little lower; raise the patient slightly. Each, with your free hand, pull the upper part of the sheet into position; lower the patient. Then, if necessary, each pass an arm under her thighs and, raising her, adjust the remainder of the sheet.

Tuck the sheet under the mattress on one side; have your assistant stretch and tuck it under on the other side.

FIG. 10.—SUPPORTING PATIENT WHILE ADJUSTING PILLOWS.

Demonstration 12

To Sit a Patient up in Bed

Important points to remember in doing this are:

1. When a patient is weak, especially when she sits up for the first time after a serious illness, she may feel faint and should therefore be supported while the pillows are being arranged.

2. A weak patient should be well supported while sitting up and the pillows should be so adjusted that they will provide a rest for her arms and fit into the curve at the neck and that at the waist line. Also, means should be taken to prevent her slipping down in bed.

3. Except in very hot weather, a wrap should be put about the patient's shoulders.

Requisites.—Back rest, six or seven pillows, shoulder wrap, knees support, twine.

Procedure:

Method 1.—If the patient is on a Gotch bed all that is required is to raise the portion of the iron frame under the mattress which acts as a back rest and, if needed, the adjustable portion under the knees and to arrange the pillows in about the same manner as when a back rest is used.

When the bed is not provided with an adjustable frame a back rest is substituted and with this, when the patient is fairly strong and able to move at will, she can usually be made comfortable if the rest is covered with two pillows. If she is weak, however, it will require about four pillows, with a canvas covered rest, and five, with a metal or wooden rest, to support her properly; an extra one will be needed if it is necessary to prevent her slipping down in the bed.

Method 2.—Proceed as follows: Arrange back rest.

pillows, and shoulder wrap where you can reach them and pile them in the order in which you will need them.[1]

Move the patient up in bed if necessary.

Pass your arm nearest the head of the bed behind her in the same manner as when changing the pillows; if necessary and possible, have the patient place her hands palms downward on the bed and, by pressing upon them, help lift herself as you raise her into a sitting position.

If she needs to be supported, pass your other arm across her chest and, if necessary, let her head rest against your shoulder.

Remove your arm from her back. Put the wrap about her shoulders. Put the rest in position and make sure that it will remain in place.

If the rest is of wood or metal, place a stiff pillow upright against it, but if the back of the rest is of canvas, this pillow can be omitted, for the soft pillows do not slip on the canvas as readily as they do on the smooth foundations.

Place a soft pillow obliquely on either side of the patient in such a manner that a corner of each pillow will fit into the curve at the patient's waist, and the remainder afford a support for her arms; place another soft pillow against the rest (or hard pilllow) to support the patient's back and one above this for her head.

Patients who are troubled with dyspnea are frequently obliged to sit up in bed continually and often like to lean forward at times. To provide for this, place a small bed table covered with a pillow in front of the patient.

[1] If the patient is so weak or heavy that one nurse cannot do this alone the assistant should stand on the opposite side of the bed and pass one arm behind the patient's head and far shoulder, placing her hand in the axilla, and pass her other arm behind the back and raise and support the patient while the pillows are being arranged.

FIG. 11.—A CHAIR USED AS A BACK REST.

To Prevent a Patient Slipping Down in Bed

The means usually employed to prevent a patient slipping down in bed are: (1) Putting a support under the knees; (2) putting a brace at the feet; (3) providing a support for both knees and feet.

The support under the knees serves also to relax the abdominal muscles, which is often desirable.

The *Meinecke non-slipping knee and thigh brace* is probably one of the best appliances to use for such supports, for, even when its shape is not quite adequate for the occasion, it can usually be made so by the adjustment of pillows or pads. The brace has rough rubber pads on its under surface which inhibit its slipping; these are not sufficient, however, if the patient is heavy and, in such a case, pass a cord of heavy, white twine through the brace, and tie it first to the sides of the bed on a line with the brace (putting it through interstices of the wires of the spring as well as around the side bars), and then to a bar at the head of the bed, on a line with the mattress. Cover the top of the support and the side under the patient's thighs with a pillow, which is protected with a rubber or pad put on under the pillowcase.

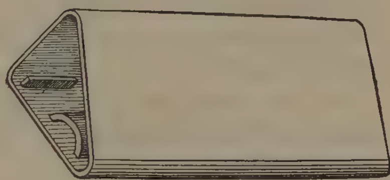

Fig. 12. Knee and thigh support.

The same kind of brace, retained in place, if necessary, in the same manner can be used at the feet.

In some hospitals a similar appliance made of bars of wood is used. It is covered and held in place in the same way as the Meinecke brace.

When there are no such appliances as those mentioned

to be had, a brace can be improvised in one of the following ways:

Method 1.—Protect a pillow by putting a quilted pad or a rubber case under the white case; double it over a cord of heavy white twine, tie the pillow if necessary.

Place it under the knees or at the feet as required. Pass the cord on each side through interstices of the wires of the spring and around the bar of the bed on a line with the pillow and then stretch it upward and tie it at the head of the bed on a line with the mattress.

Method 2.—Put a pillow in a quilted pad or rubber case and then place it in the center of a sheet that is folded diagonally.

Put the pillow under the knees or at the feet, as required, and tie the ends of the sheet to a bar at the head of the bed.

Demonstration 13

To Move a Patient from the Bed to a Stretcher

In preparation for this demonstration, the pupils should read, or be told, something of (1) the local conditions existing when there is pus in any of the abdominal organs; (2) the dangers of rupturing walls or adhesions which may be localizing the infection and of the consequent peritonitis; described under Infection. The fact should be emphasized that such rupture may occur if the patient makes strenuous movements and that, therefore, when a patient is suffering from any septic abdominal infection, she is not to be allowed to assist when being moved from the bed to the stretcher.

Requisites.—Two blankets besides those on the bed, shoulder wrap, stretcher.

Procedure.—Replace the bedclothes with a small blanket as described later.

Draw the patient to the side of the bed and flex her knees.

Draw the stretcher close to the same side.

Stand on the free side of the stretcher and, reaching across it, pass one arm under the patient's head and shoulders and the other under the upper part of her thighs. Draw her over on to the stretcher.

If the patient is heavy or is not able to help herself it will require two to move her. In such a case put one arm under the small of her back, instead of under her thighs, and have an assistant put one arm under the thighs and one under the knees.

After the patient is on the stretcher, cover her with the other blanket[1] and tuck this under her along the sides and at the feet.

Put the wrap around her head and shoulders. (This is sometimes omitted when the operating room is near the ward.)

To replace the bedclothes with a blanket.[2]—Fold the blanket in four,[2] if it is not, as is usually the case, already so arranged.[3]

[1] In cold weather a large thick blanket which can be doubled is used for this purpose. The one put next the patient, on the contrary, is at least partly cotton, for to most people this feels better than wool and the blanket is not so easily injured by the frequent washings that its use necessitates as a woolen one would be.

[2] This is a method of replacing the top covers with a blanket that is very commonly used when it is necessary to do this for any purpose, for, if properly performed, it prevents any exposure and, after a little practice, it can be done very quickly and deftly.

[3] If the blanket is a large one, it will be better, when using it to cover a patient on a stretcher, to double it before folding it in four. Usually, blankets kept for this purpose are folded in the way they will be needed before they are put away after use.

Put it across the chest with the free ends facing the head. If the patient is well enough she can usually be asked to hold one of the ends; if not, tuck it under her shoulders or the pillow.

Take hold of the other end between your third and fourth fingers, on each side of, and a little beyond, the

Fig. 13. Replacing bed covers with blanket.

patient. Put your other fingers under the bed covers and your thumb on top.

Make a fold in the covers about twelve or fourteen inches deep, then, still holding the blanket, and with your thumb on top of the covers, pass your other fingers under the upper edge of the fold and repeat the procedure. Repeat as often as necessary to fold the clothes below the patient's feet or to about within twelve inches of the foot of the bed, taking the edge of each new fold with those you are already holding between your thumbs and your first and middle fingers.

If the folded clothes do not come below the patient's feet, put your hand under the blanket and lift them over.

Demonstration 14

To Put an Anesthetized Patient to Bed

In preparation for this demonstration the pupils should read the causes and symptoms of shock and hemorrhage, see Chapters VIII. and XXI.

Very essential points to be considered in connection with this procedure and the care of the patient immediately following her return from the operating room are as follows:

1. The patient must be lifted carefully and kept quiet; for (a) strenuous movements may cause tearing of stitches or hemorrhage: (b) in septic conditions, movement of the muscles of the affected part may help diffuse the infection, because septic material in the tissues is absorbed chiefly by the lymphatics,[1] and absorption and the circulation of the lymph are furthered by muscular movement; (c) in abdominal infections if there are adhesions localizing the septic material, these may be broken down and a general peritonitis thus initiated.

2. The patient must be constantly watched. The pulse should be felt at regular intervals (at least every half-hour after major operations); any change in the color of the skin and character of the breathing[2] must be noted immediately; when the patient is nauseated or restless she is not to be left alone for a second. The emergencies most likely to occur immediately following operation are

[1] What are the lymphatics? What are the factors controlling the circulation of lymph? If these questions cannot be answered read the sections describing the lymph system in an Anatomy and Physiology textbook.

[2] What change will occur as the result of (a) hemorrhage? (b) shock? (c) obstruction to breathing? See section on Symptoms, Chapter XIX.

hemorrhage, shock, and asphyxia. Asphyxia is usually due to obstruction of the air-passages as the result of the tongue falling back over the larynx or of vomitus entering the trachea.

3. The patient must be kept warm and a very important means of doing this is to keep her surrounded with blankets until the diaphoresis induced by the anesthetic[1] ceases. The reason for this being (a) blankets, even cotton ones are poor heat conductors and thus inhibit loss of heat from the body to a greater extent than sheets; (b) they absorb the sweat and thus prevent rapid evaporation from the skin and the consequent chilling of the body. The two main reasons why it is so important to keep the body warm following anesthesia are: (a) owing to depression of the nervous system, vital body functions are more or less interfered with and thus the state known as *shock* is very easily induced and cold predisposes to such a condition while warmth tends to inhibit it. (b) If the surface of the body is chilled, the skin, blood-vessels, and, if the chilling is at all intense, the muscles will be contracted and the blood thus driven to the interior of the body to such an extent that congestion of internal organs results. As chloroform and ether irritate the respiratory tract and kidneys,[2] congestion of these organs is likely to result in bronchitis, pneumonia, or nephritis.[3]

4. If hot-water bags are left in the bed there is danger of burning the patient, and the worse the patient's condition the greater the danger, because, when the superficial

[1] See under Ether and Chloroform, in Materia Medica, the reasons for diaphorésis.

[2] How is it possible for the kidneys to be irritated by the anesthetics?

[3] What is nephritis?

circulation is sluggish, blisters[1] are more readily induced than under normal conditions. If the patient is wrapped in warm blankets she will, under ordinary conditions, be warm enough, and so many anesthetized patients have been burned that it is now a rule in many hospitals that, except in emergency, heaters are not to be left in the bed without a doctor's order. If they are used, observe the following rules:

(a) Fill and cover them as described in Demonstration 7.

(b) Put a layer of blanket between them and the patient.

(c) After a short time, look at the patient's skin at any part where a bag is in contact, even though the blanket is between skin and bag. If the skin looks red, move the heater, report the fact to the nurse in charge, and rub a little oil or vaseline over the reddened area.

(d) Tell the nurse who relieves you when you go off duty that you have put heaters in the bed and how many

Requisites for demonstration.—Same as for Demonstrations 7 and 13.

Make an anesthetic bed. Have the patient[2] on the stretcher and covered with blankets as in Demonstration 13.

Procedure.—This should follow, as far as possible, the usual régime occurring when an anesthetized patient is brought to bed, and as the stretcher is brought near one pupil should prepare the bed.

To prepare the bed, if it has been made according to Method 1, fold the upper covers to the far side of the bed

[1] What are blisters? If not able to answer this question read the section on the nature and causes of blisters in the chapter describing the skin in Anatomy and Physiology.

[2] It is well that this should be a pupil.

and remove the heaters. If the bed has been made according to Method 2, turn back the sides of both the blankets and remove the heaters.

Place the stretcher at right angles with the bed with either the head of the stretcher at the foot of the bed, or the foot of the stretcher at the head of the bed. Or the stretcher can be placed parallel with the bed (but far enough away—about three feet—to allow the lifters to turn) with the patient facing the head of the bed.

To lift the patient.—Method 1.—The lifters—three will be required unless the patient is small or of light weight—all stand on the same side of the stretcher, between bed and stretcher. All pass your arms as far under the patient as possible, tilt her slightly toward you.

Do not lift until your backs are straight, your shoulders thrown back, and you are all ready and know exactly what to do. All lift and turn at the same time and walk to the bed.

To arrange the patient in bed in the supine or dorsal recumbent position.—If the bed has been made according to Method 1, lay the patient on her back. Draw the covers over her, if the blanket covering her belongs to the operating room, remove it, have one of your assistants fold it and place it on the stretcher.[1] Tuck the bath-blanket under the patient's shoulders. Tuck a towel around her neck, and under the upper edge of the bath blanket, arranging it so that it will protect the blanket and other covers if the patient vomits. Turn the patient's head on one side. Count her pulse at either the facial or temporal artery, and record its rate and character.

If the bed was made according to Method 2: When the

[1] This blanket is removed, because, as a rule, it belongs to the operating room and, also, it will be damp if the patient is perspiring profusely.

patient is laid on the bed draw the sides of first the upper and then the lower blanket over the patient, over the blanket covering her. Then remove the latter. If

Fig. 14. Dorsal or supine position.

the patient is likely to be restless, wrap the lower blanket around her legs and feet, otherwise, draw it so that the opening will be on one side, and arrange it smoothly above and below her legs and feet.[1] Wrap the upper blanket snugly around her neck and chest. The two blankets should meet at about the groins.

Draw up the bedclothes and proceed as already described.

Demonstration 15

Fowler's, Prone, and Lateral Positions

Nature of Fowler's positions.—There are two positions commonly known as *Fowler's position*, being so named

[1] This arrangement of the blankets has, under many conditions, certain advantages, viz.: (a) Wrapping the lower blanket around the legs helps to restrain a restless patient's movements; (b) if the patient is raised to a sitting position, the blanket can be kept around her back and shoulders while and after her position is changed; (c) it facilitates giving stimulating enemata, rectal irrigations, etc., without any exposure; (d) the blankets can be removed when they are no longer required without disturbing the regular covers.

after the surgeon who first advocated elevating the trunk in septic abdominal conditions. In one method, the head of the bed is elevated about eighteen or twenty-four inches and the patient lies in the supine position with knees flexed. In the other, the patient is raised into a semi-sitting position, the knees are flexed and sometimes the head of the bed is slightly elevated (about six inches).

Reasons for Fowler's position when abdominal infection exists.[1] (1) The slower the income of the infectious

Fig. 15. Fowler's position.

matter the better chance the natural defenders of the body[2] have to overcome it. (2) Septic matter is absorbed chiefly by the lymphatics and there are a great many more lymph vessels and nodes in the upper part of the abdomen, around the diaphragm, than in the pelvis. (3) The flow of lymph, in all parts of the body, is toward

[1] Reasons for the use of this position under other conditions were given under Demonstration 13.

[2] What are these? If not able to answer this question, read the sections on phagocytosis and antitoxins in the chapter in Anatomy and Physiology which describes the blood and its functions, or in your textbook of Bacteriology.

the heart. Because of facts 2 and 3, either elevating the head of the bed or placing the patient in a sitting position tends (a) to inhibit absorption by promoting the drainage of any free septic material to a part of the body that is relatively poorly supplied with lymphatics; and (b) to lessen the rapidity with which the absorbed toxic matter enters the circulation since, with the patient in either of these positions, the flow must be against gravity and it is thus retarded. (4) Flexing the knees tends (a) to relax the abdominal muscles and thus to lessen strain on the wound; (b) it helps to keep the patient from slipping down in bed.

The degree of elevation is a most important point to be

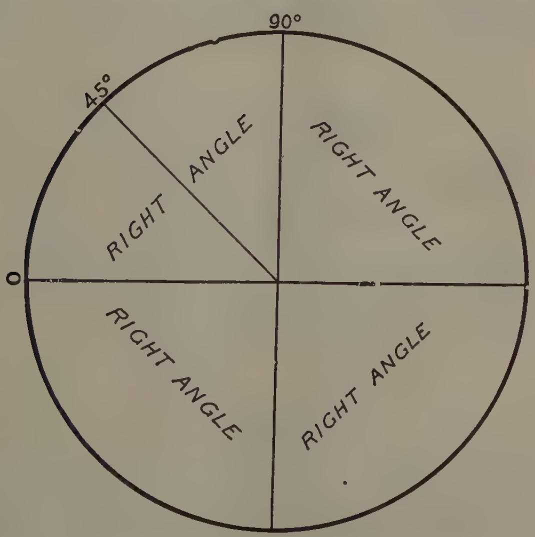

Fig. 16.

considered when putting a patient in Fowler's position: for, in order to secure efficient drainage, between 40° and

50° of elevation is required and, therefore, this much must be used, but, as the position is a trying one to a person in the condition that patients usually are when they need to be so placed, a greater degree of elevation than necessary should not be used. Fig. 16 will give some idea of what is meant by 40°. It is to be understood that the diagram is based (from trigonometry)[1] upon the fact that a circle is divided into 360° or four right angles, each of which would therefore contain 90°. Hence, if the patient were seated absolutely upright she would be at an angle of 90° in relation to the bed and, since the halfway point is 45°, approximately 40° can be obtained by placing the back rest slightly below this.

Nature of the prone position.—In this position, the patient is laid prone—*i. e.*, face downward—but with her

Fig. 17. Prone position.

head turned on one side so as not to interfere with breathing, a pillow is placed under the head and one under the lower part of the chest as described in Demonstration 7.

The objects of this position are.—(1) To secure drain-

[1] The science of measuring the sides and angles of triangles, and ascertaining the relations between them and stated parts.

age of pus to the front of the abdomen where there are even fewer lymphatics and blood-vessels than in the pelvis. (2) To keep pus away from the spine along which there are spaces which are favorable for the formation *of pockets*—*i. e.*, collections of pus and fluid. (3) To facilitate drainage from the wound.

Nature of the lateral position.—The patient is placed on the right side, inclining forward, and a pillow is placed

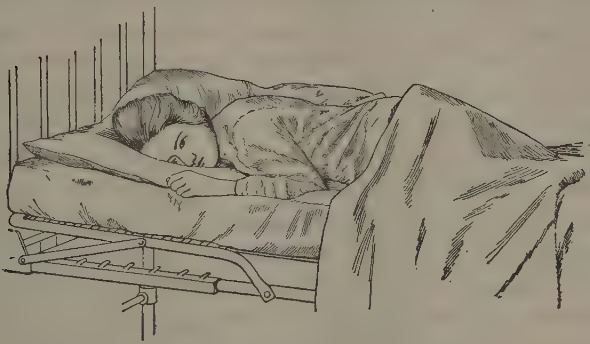

Fig. 18. Lateral position.

under the region of the liver to, by its pressure, obliterate space in which fluid can collect in the kidney region.

The objects of this position are the same as those desired in the use of the prone position.

Requisites.—Articles used for Demonstration 13 and, in addition, those required for sitting a patient up in bed, see Demonstration 12.

Procedure when putting a patient in Fowler's position. Method 1.—Place the patient in position on the bed as in Demonstration 13, flex the knees and support them, see Demonstration 12, be sure that the support is securely fastened. Raise the head of the bed on whatever the hospital provides for the purpose.

Method 2.—The procedure when placing a patient in the sitting—so-called—Fowler's position is about the same as in Demonstration 12, but, as already stated, it is very important to consider the height to which the patient is raised—this, it will be remembered is to be an elevation of between 40 and 50 degrees—and, of course, the patient must be very well supported while you are arranging the pillows. If the bed is provided with an adjustable rest, all that it is necessary to do after the patient is laid on the bed, is to turn the lever and raise the frame as required and then place a pillow on each side of the patient to support her arms and, if necessary, a small pillow or pad in the curve at the lumbar region and one behind the head. If there is no such frame, use a back rest and pillows,[1] as in Demonstration 12; and have the nurses lifting the patient from the stretcher hold her in the desired position while you, standing on the opposite side of the bed, adjust the supports. Put these, if the bed has been arranged according to Method 2, under the upper blanket. If the bed has been made following Method 1, a shoulder wrap will be needed; place this on top of the pillows and, when the patient is in place, draw the ends over her shoulders in the same way as, otherwise, the blanket would be arranged. When there is not an extra nurse to arrange the pillows, the one who is to do so should support the patient's legs while she is being lifted from the stretcher, for, as soon as the patient is on the bed, this nurse will be free. Exchange the blankets in the same movement as in Demonstration

[1] Even when the hospital is provided with beds with adjustable rests, the pupils should practice putting the patient in position without this help as they may be obliged to do so sometimes and it is a very difficult performance with an anesthetized patient. One of the heaviest pupils should act as subject.

14. This can be done either before or after the patient is in position.

Flex the patient's knees and support them in the usual manner. If the patient is heavy a brace at the feet will probably be necessary. If required, elevate the head of the bed.

The procedure in putting a patient in the lateral and prone positions is practically the same as for the supine, except that, for the lateral, the patient is placed on her right side, inclining slightly forward and, for the prone, if she is not in this position on the stretcher, she is laid on her side and after the blankets have been exchanged, turned further forward so that she will be lying prone and her head must be turned so that she can breathe easily. If the pillow under the liver region or, for the prone position, that under the chest, is not in the right location one or two nurses, as required, should lift the part of the body where change is necessary while another, standing on the opposite side of the bed, slips one hand under the region of the wound (to obviate danger of pulling the dressing) and, with the other hand, adjusts the pillow. Probably, the easiest way to lift the patient, if she is heavy, will be for each of the lifters to pass her arms around the body getting her hands well underneath. Of course, endeavor should be made to avoid any need for such change since it is most imperative that patients requiring to be placed in either of these positions should be moved as little as possible, even *while they are unconscious*, the reason for this has been already stated.

When the patient is in the lateral posture, it may be necessary, as the head of the bed is elevated to place a brace at her feet, and usually, when the patient's condition is favorable, a pillow is put under her head, but

some surgeons prefer that this should be omitted until the patient is conscious and complains of discomfort.

Demonstration 16

To Move a Patient from One Bed to Another

Requisite.—An extra bed.

Method 1.—This can be used for a convalescent patient.

Remove the top covers except the sheet and one blanket; loosen these at the bottom and sides.

Draw the patient to the side of the bed. Move the second bed to this side and so arrange the sheet and blanket covering the patient that they will cover part of the second bed as well.

If the patient needs assistance, lean across the second bed and draw her over in same way as when drawing her to one side of the bed.

Method 2.—Proceed as for Method 1, but loosen the clothes under the patient and draw her over on to the new bed by making traction on these.

If the patient is heavy, have an assistant, if possible, and, both standing on the same side of the bed, draw the clothes at the same time, with equal force.

Method 3.—When the beds are of unequal height or when they cannot be placed together the patient may have to be carried and, unless she is light, one or two assistants will be needed. If the beds are in the same room, the distance to carry the patient can be shortened by placing them in the same relative position to each other that the stretcher and the bed were in the former demonstration. Proceed as follows:

Wrap the patient in a sheet and blanket. To do this

remove the upper bedclothes, except the sheet and one blanket. Turn the patient on her side and pass a little more than half of the sheet and blanket behind and under her and, after turning her on her back, draw them up as far as possible over the part covering her.

Pass one arm under the patient's head and shoulders and another under her back.

Have one assistant pass her arms under the back and buttocks and the other, pass hers under the thighs and legs.

Draw the patient to the edge of the bed; ask her to hold herself as stiff as possible; straighten your backs; remember instruction 8, page 19, decide which foot each one is to step with first; lift in unison and carry the patient to the other bed.

Demonstration 17

To Carry a Patient on a Chair Made with the Hands

When it is necessary to carry a patient any distance, if she is well enough to sit up, an easy way to do so is to carry her on a chair made with the hands.

To do this, put on her wrapper and stockings, see page 101, or wrap her, as just described, in the sheet and blanket, but leave her arms free and put a wrap over her shoulders, and pin it in front to the top edge of the blanket.

Draw her to the edge of the bed; raise and turn her so that she will sit with her legs over the side.

Grasp your left wrist with your right hand and have your assistant clasp her left wrist in like manner.

Both pass your hands under the patient's thighs and each clasp the other's right wrist with her left hand.

Have the patient place one hand on your far shoulder and the other on your assistant's.

Demonstration 18

To Move a Patient from the Bed to a Chair and Vice Versa

Requisites.—Chair, two ordinary sized pillows, one small pillow, shoulder wrap, blanket, wrapper or kimono, stockings, slippers.

Arrangement of Chair.—If a patient, even though well enough to stand and take a few steps, is weak, or if she must be lifted, the chair is to be placed so that no unnecessary turning or walking will be required. Therefore, place it either parallel with the bed, about two feet from it, facing the head; or else at right angles with the bed, facing it, if it is near the head, or with its back against it if near the foot.

Make the chair comfortable with pillows. Unupholstered chairs, such as are used in hospitals, require a pillow in the seat and one at the back, also, a small one to fit into the neck and under the head is desirable, but this last is not put in place until the patient is in the chair. If the chair has not a foot rest provide something that will answer the purpose.

Except in very warm weather, place a wrap to go around the patient's shoulders over the pillows at the back of the chair and another over the pillow in the seat; or, if the patient is to sit out of doors and the weather is cold, put the latter wrap under the pillow, it should be large enough to extend up a considerable distance under the pillow at the back of the chair and to turn up over the patient's feet and to be wrapped around her to above the waist line.

FIG. 19.— ARRANGEMENT OF WRAPS TO KEEP A PATIENT WARM WHEN SHE IS IN A CHAIR.

Sometimes a large colored blanket is substituted for the two wraps and it is usually placed cornerwise with, in order to retain the blanket in place, the top corner hanging over the head of the chair. This corner is turned back behind the blanket after the patient is in position so that the pillow, and not the blanket, will be against her neck. The lower corner of the blanket should be left long enough to turn over the patient's feet and legs to at least the knees.

If a wheel chair is used see that the foot rest is up out of the way and block it so that it will not move.

Preparation of patient.—The first time that a patient is taken out of bed she usually wears only a wrapper and stockings.

To put on the wrapper.—If it is a closed one, put it on in the same manner as a closed nightgown.

If it is kimono pattern and the patient is not well enough to sit up in bed and slip her arms into the sleeves, spread it out on the side of the bed, under the top covers; draw the patient over until she lies on its back width and put her arms into the sleeves; fasten it in front or the ends may get in the way when the patient is lifted.

Draw the patient to the edge of the bed and put on her stockings.

To put on the stockings.—Turn the part of the stocking foot below the heel into the leg of the stocking. Slip the stocking foot over the patient's foot and pull up its leg.

Turn down the bedclothes.

To lift the patient into the chair:

Method 1. If the patient can help herself, put your right arm under her head and shoulders and your left arm under her knees, then raise and turn her so that her legs will be over the side of the bed. Steady her for a few seconds. Put on her slippers. Have her put a hand

on your far shoulder, put your arm around her waist and support her as she walks to the chair. Put the foot-rest in place. Arrange the wraps around the patient, pin them if necessary, be sure that she is comfortable. Note the rate and strength of her pulse. Make the bed.

Method 2. If the patient cannot help herself, flex her knees. Put your arm diagonally across her back, placing

Fig. 20. Carrying patient.

if possible, your hand in her axilla. Pass your other arm under her knees. Have her clasp her hands on your shoulder, putting her arms across your back and chest, **not around your neck.** See Fig. 20.

Method 3. If the patient is so heavy that two lifters are required, raise and turn her so that her legs will be over the side of the bed. Stand one on either side the patient. Let one lifter put one of her arms around the

FIG. 21.—HELPING A PATIENT GET INTO BED.

patient's waist and one under her knees while the other puts an arm across her shoulders, placing the hand in the axilla, and an arm under the thighs. Have the patient put an arm across each lifter's back and place her hands firmly on their far shoulders.

The lifters should stand on opposite sides of the chair while putting the patient into it.

To lift the patient from the chair to the bed:

Method 1. Lift the patient as when taking her from the bed in Method 2, but, as this will be much more difficult on account of the lowness of the chair, be particularly careful to grasp her securely and, before you lift her, tell her to hold herself as stiff as possible. If she is strong enough have her place her feet upon the floor and give herself a slight upward movement as you lift her.

Method 2. If the patient is so heavy that two lifters are required, stand one on each side of the patient. Take hold of her as when lifting her out of bed according to Method 3. Follow the precautions given in the preceding paragraph and before lifting the patient be very sure of the turns you are to make and see that there is nothing in your way. It is usually better to have the chair parallel with the bed, near the foot, facing the head.

Method 3. When a patient only requires help because of the height of the bed, have her stand against the edge of the bed and place her hands upon it, the one nearest the foot of the bed somewhat further back than the other. Place one of your arms around her waist and the other under her knees. Tell her to raise herself slightly by pressing her hands on the bed and, as she does so, raise her on the side of the bed and then turn her into position.

After the patient is in bed, draw up the covers; take off the wrapper in the same way as you would a nightgown;

take off the stockings by slipping your hand through the opening and drawing them down.

If the patient has been up for the first time following a serious illness or if there is any reason why sitting up should affect her heart, count her pulse and record its rate and state if sitting up has any effect upon its character.

CHAPTER VI

Some of the Routine Procedures Incidental to the Comfort and Care of Patients

Essentials for patient's comfort. Methods of making patients comfortable under various conditions. Causes and prevention of pressure sores and chafing. Undressing patients. Care of patients' belongings. Cleansing baths. Care of the hair. Care of the mouth. Methods of giving and removing the bedpan. Preparation of patients for the night. Restraining delirious patients. Care of the body after death.

Essentials for Patient's Comfort

Carrying out orders and giving treatments and medication are not by any means all that is essential in the care of patients. The *good nursing* that, when life and death are in the scales, tips the balance in favor of life contains at least two other very essential elements; viz., a prompt recognition of changes in a patient's condition and keeping the patient at rest.

Rest in this instance means that the vital organs, especially the heart, are to be spared all unnecessary effort and, to do this, not only must the patient be kept quiet in bed, but, it is most important, that all excitement, anxiety, and annoyance be prevented. To realize that this is the case recall how the rate of your own heart has been increased when you have become angry, or been frightened, or otherwise excited. As a matter of fact,

the heart action is often accelerated to a greater degree by the nerve impulses arising from such sources than from very active exercise.

Two other points that must be realized in this connection are: (1) That little things which a person would hardly notice, much less be annoyed by, when well may be a source of great irritation to a sick person. (2) That an action which would entail no exertion at all to a healthy person may be attended with considerable effort if performed by a sick one.

Examples of heedlessness on the part of nurses which oblige patients to make unnecessary effort are: (1) Allowing a very ill patient to hold a glass or tube while drinking; (2) not providing a drinking tube of a shape to let the patient suck up the liquid easily in the position in which she is lying; (3) permitting a weak patient to turn or move unaided, or more than necessary, when it is essential to change her position for any reason; (4) not providing sufficient prop to support a weak patient when she is lying on her side or is in other position which it is an effort for a sick person to maintain.

Some of the important things to remember in order to shield a patient from unnecessary anxiety and annoyance are as follows:

1. Give kindly greeting to a patient when she enters the ward or is committed to your care. A patient's idea of the hospital and her consequent readiness to be pleased or displeased, to have confidence in those to whom she must trust herself or fear of them, is often based upon her first impressions and these, usually, are made chiefly by the nurses whom she first encounters. It is to be remembered that the word hospital is derived from the same word as hospitality, the reason for the derivation being that in the early days of Christianity, the Christian lead-

FIG. 22.—HOLDING GLASS AND DRINKING TUBE WHILE PATIENT TAKES A DRINK.

ers had those who were sick and in want come to their homes where they were sheltered and cared for.

2. Notice if your patients seem worried and when so in a tactful manner, avoiding all appearance of curiosity, try to ascertain what is the matter, for their anxiety may be about something for which relief can be found.

3. Notice if any of a patient's visitors tire or annoy her and, when so, notify someone in authority.

4. Never expose a patient more than necessary when giving treatments and the like.

5. Always put a screen or draw the bed curtains around a bed in the ward before giving a patient a bedpan, doing surgical dressings, giving baths, treatments, and the like.

6. Before starting to do anything for a patient be sure that you have everything that you will need for the work at hand.

7. Before beginning a treatment, tell a conscious patient something of what you are to do, especially when you are to use some apparatus that may seem mysterious or alarming to the patient.

8. Notice when a light worries a patient or when she is in a draught.

9. Endeavor to remember a patient's likes and dislikes, especially in regard to her food.

10. Never take longer than absolutely necessary to fulfill a patient's request, especially when she has asked for the bedpan or a drink.

11. Never discuss a patient's condition with others in her presence, even though she be apparently unconscious.

12. Never discuss a patient's condition where those not authorized to know of it can hear you.

13. Never, under any circumstance, tell one patient anything whatever about your other patients.

14. It is often necessary to use great tact in answering patients' questions about their condition, medication, etc., and it is well, as far as possible, to avoid discussing these things with patients.

15. Do not give a patient any unfavorable information regarding the hospital equipment or the capacities of those employed in it, on the contrary, do everything in your power to increase her confidence in the general efficiency of the institution, for such confidence is a most essential element for a peaceful mental state.

16. Never lean or sit on a patient's bed and be careful not to knock against it in passing.

17. Never rock in a sick-room.

18. Keep door and window hinges oiled and never allow doors or windows to bang. Find the source of irritating noises, even if they are out of doors, and stop them if possible.

19. Make and keep your patients as comfortable as possible for bodily discomfort will be very provocative of restlessness and mental disturbance.

Some of the means that can be used to secure comfort and relieve discomfort are as follows:

1. Rub the body, especially the back, with alcohol or give a light massage, unless existing conditions prohibit its use.

2. Pull the draw-sheet partially through under the patient so that she may lie on a cool place.

3. Change the position of the pillows when they become disordered or uncomfortable.

4. Place small pillows or pads or hot-water bags filled with tepid water in the hollow of the back when pain has been caused in the latter by lying for a long time in one position.

5. When the patient is very thin, relieve pressure on

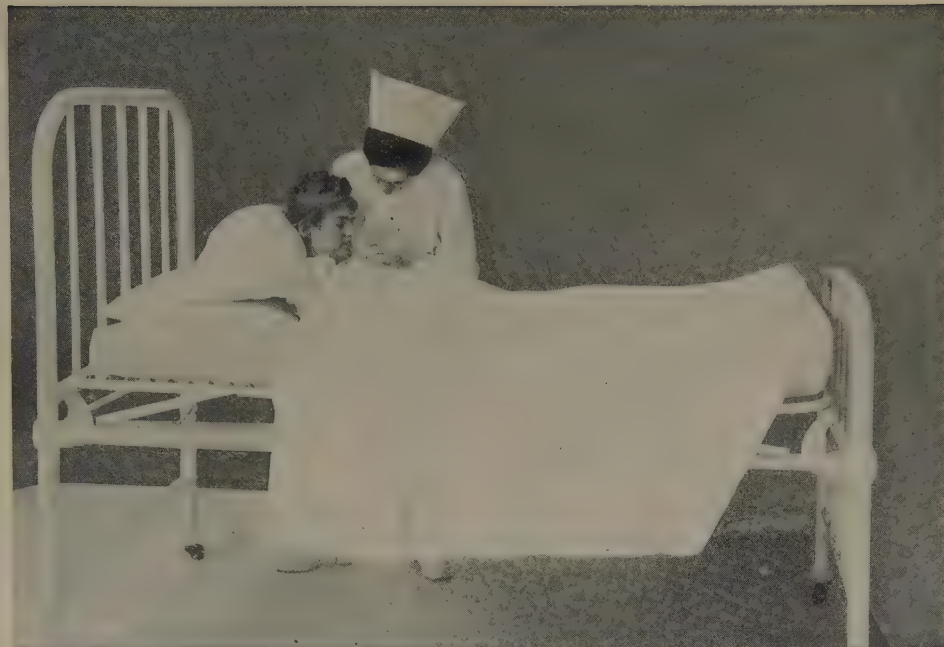

FIG. 23.—SUPPORTING PATIENT WHILE SHE TAKES A DRINK.

bony protuberances by laying air rings or pads made of batting or non-absorbent cotton and gauze under them.

6. Flex the patient's knees as described on page 83 to relieve abdominal strain or pain by relaxing the abdominal muscles.

7. Support the bedclothes on a cradle when their weight causes discomfort to any part of the body.

8. When there is a tendency to foot drop, put a support at the feet; a large sandbag furnishes an excellent prop for such purposes.

9. When a weak patient lies on her side or sits up in bed, she must be supported with pillows, it would be impossible to state definitely how the pillows should be placed other than that they should be so arranged that the patient is so adequately supported—that it will be no effort for her to maintain her position.

10. Change the patient's position, if possible, when she is tired and do not forget that no matter how comfortable a helpless patient may be made she is likely to become excruciatingly tired if she is obliged to remain in the same position indefinitely. A frequent change of position is also often necessary to prevent pressure sores and, sometimes, especially with old people, hypostatic pneumonia.

Pressure Sores

As many of the means taken to secure patients' physical comfort are also essential to prevent pressure sores it will be well to learn the causes and special measures used to prevent these sores before studying the measures used to make patients comfortable.

Definition.—A pressure sore consists of ulceration and necrosis of a localized area of tissue as the result of pressure upon the part.

Pressure causes necrosis, *i. e.*, death of tissue, **by** limiting its nutrition, it does this by (1) inducing a passive congestion[1] in the veins and capillaries surrounding the affected area, which restricts the inflow of fresh blood to the part, (2) squeezing the lymph from its contact with the cells.

Common causes of pressure are: (1) The too tight adjustment of splints, casts, etc., or their improper application; (2) crumbs in the bed or wrinkles in the sheet, nightgown, etc.; (3) sameness of position for prolonged periods.

Predisposing causes are: (1) Moisture, such as is occasioned by diaphoresis **(excessive perspiration),** involuntary urination and defecation; (2) emaciation; (3) lowered vitality, as in old age or long continued illness; (4) conditions which interfere with the nutrition of the cells, such as diseases that tend to interfere with the circulation, *e. g.*, cardiac diseases and nephritis; severe anemias, excessive obesity, paralysis, diabetes; (5) breaks in the skin, and the presence of boils, pimples, and chafing.

The localities in which pressure sores will form most rapidly are: Over the bony prominences,[2] such as the end of the spine, the heels, shoulder blades, elbows; and, especially in obese patients and those with edema, the buttocks; and, in children, the back of the head and the ears.

Signs that pressure is affecting the circulation in a

[1] Described in Chapter VIII.

[2] The walls of the blood-vessels are much more easily pressed together, and the circulation of the blood through the vessels thus prevented, when the latter are near the surface and upon a resisting ground, as bone, than when they are embedded in a soft yielding tissue.

part and injuring its tissues are: Increasing redness and soreness followed by, unless the condition is relieved, an edematous state of the surrounding area and deepening discoloration. Such a condition is soon followed by breaking of the skin and ulceration,[1] and in bad cases. sloughing[1] of the exposed parts.

A wound of this kind is likely to be particularly painful and it is hard to heal, because it cannot do so until the sloughs are removed, for these are masses of dead tissue which cannot be recuperated, and their removal is often a very tedious process. Also, the open surface and decomposing sloughs afford the best possible soil for suppuration and the consequent production of toxins,[2] which will be absorbed by the blood, and even the least virulent toxins are detrimental to normal body conditions.

As the toxins, pain and discomfort will certainly retard, and perhaps prevent, a patient's recovery and cause her what is usually unnecessary, because preventable, suffering, nurses must feel that the prevention of such sores is one of their most important duties and that every effort and abundance of time are to be devoted to the endeavor. *Except in very, very rare instances, those nursing a patient are responsible, and should feel thoroughly disgraced if she develops a bedsore. Unremitting care has saved many a patient from this infliction when it has seemed perfectly impossible to do so. To do this is one of the greatest achievements in nursing and, the greater the difficulties, the greater should be the nurses' desire and ambition to surmount them and show what "good nursing" can do.*

Measures necessary to prevent pressure sores.—From what had been said regarding the causes of pressure sores

[1] If these terms are not understood see the description of different kinds of wounds and the healing of wounds in Chapter XX.

[2] See page 725.

it can be readily appreciated that the principal means of preventing them will be measures which will preclude pressure, friction, and the presence of moisture, and that will improve the circulation of blood and lymph in the parts. Examples of such measures are: (1) Adequate padding of splints and orthopedic appliances; care not to adjust these or bandages any tighter than necessary to attain the purpose for which they are used, but (2) to have anything that will move and cause friction fastened sufficiently securely to prevent it doing so. (3) To keep the bed free from crumbs, and sheets, nightgown, pads, binders, and the like free from wrinkles. (4) To keep the bed free from moisture; as an aid to accomplishing this, if the patient is having involuntary urine or defecations, put a soft pad which can be changed as soon as it becomes wet under her and it is most imperative for the rubber sheet to have a thick enough protector to hinder it preventing the evaporation of sweat. (5) To keep the skin of the affected parts in good condition by (a) washing it, very gently,[1] using a soft cloth, with hot water and soap, at least twice a day, (b) applying alcohol or one of the various lotions commonly used for the purpose and a little powder after the wash and, if necessary, as often as every hour; (c) massaging the surrounding area at least three times a day—when doing this, keep the fingers or hand still on the part you are massaging and move the tissues; do not rub the skin, especially of parts that are discolored for, by doing so, you may cause a break. (6) To, if possible, frequently change the position of a patient whose condition is conducive to the formation of bedsores, it may be necessary to do this as often as every

[1] If the parts are so soiled that gentle washing will not clean them, apply a little warm oil to soften the soiling matter and then remove this with ether or warm alcohol.

hour. (7) To relieve pressure upon parts that show signs of irritation and congestion by the use of rings or soft pads and, in extreme cases, an air mattress. An air mattress must not be made more taut than absolutely necessary or it will cause as much pressure as an ordinary mattress.

It is, of course, when a patient's position cannot be changed that the danger of the development of bed-sores is greatest, and, in such cases, all the other precautions must be the more conscientiously and frequently carried out.

As soon as there is any indication of the formation of a pressure sore mention should be made of the condition on the patient's chart and the head nurse should be notified. If the skin breaks, the sore must be treated as a similar one from other causes. The treatment consists chiefly in irrigating the part sufficiently frequently to keep it free from discharge and either exposing it to the air or applying a dressing, this of course is prescribed by the physician.

Chafing

By chafing is meant, in this instance, **to make sore by rubbing** and the common sources of friction are: (1) The apposition of two surfaces of the body; (2) the contact of rough or otherwise irritating clothing, bandages, and the like.

The common sites of the worst degrees of chafing are: The buttocks, especially in infancy; between the chest and pendulous breast; between the thighs and a pendulous abdomen.

Predisposing causes are: Moisture; a tender skin, as in infancy; conditions which interfere with proper nutrition of the skin, as obesity, long-continued illness, dropsy, and poor circulation of the blood from any cause.

The signs of chafing are: redness, and, usually, itching of the skin; also small pimples or similar lesions may appear.

Deplorable consequences may complicate chafing if the condition is not ameliorated for the skin is likely to break and then ulcers may form, and though, unless the ulceration is allowed to progress, there will not be the sloughing of tissue that occurs in pressure sores, the ulcers are painful and often hard to heal.

The preventative measures consist in keeping the skin clean and dry and excluding all causes of irritation.

By keeping the parts clean is meant not only free from visible soil, but, also, from the excretory products of the skin; thus the parts should be washed with warm water and a good soap at least twice a day, and an infant's buttocks and the surrounding parts must be washed after every defecation. The washing and drying should be done by gently patting, not rubbing, the parts. All the soap must be removed with clear, warm water. This, especially in the care of infants, is most important for even the best soaps, if not washed off, may irritate a tender skin. The washing should be followed by an application of (a) alcohol, (b) powder and the parts massaged, as for the prevention of pressure sores, without friction—a tender or irritated skin should not be rubbed. Alcohol, or some astringent wash, and powder must be applied after each washing, and more frequently if necessary, and a thin layer of soft absorbent material—as absorbent cotton—put between irritated skin surfaces that come in contact and this is to be changed if it becomes at all damp.

Proper washing of a child's diapers is a most important prophylactic measure against chafing and ulceration of the buttocks. Only good laundry soaps should be used

and never strong soda or other alkaline solutions, and the diapers should be rinsed through at least two supplies of clear water. Rough or harsh material or that rendered so by washing should not be used for diapers.

As free circulation of the blood through the superficial blood-vessels of the threatened parts is a most important preventative and curative measure, all possible means are to be taken to avoid even slight pressure.

Demonstration 19

Making a Patient Comfortable in Different Positions

Aim.—To make a patient comfortable by the use of various mechanical devices.

Requisites.—(1) A back rest; (2) a straight-backed chair to use as a substitute for a back rest as shown in Fig. 11; (3) pillows, 4 large and 2 small; (4) a rubber ring cover, and attachment for inflating it; (5) cotton and bandage to make cotton rolls; (6) 2 large sandbags; (7) a bed cradle and substitutes such as a wide board that can be put across the foot of the bed and a wooden box with the ends removed; (8) 2 towels; (9) a hot-water bag.

Procedure.—Make the patient comfortable in different positions using some or all of the devices provided for the purpose. Some of the pupils should in turn be "patient" for this demonstration. The following are the only procedures that have not been described in other demonstrations.

Use of the bed cradle.—The clothes can be raised from any part of the body by the use of cradles or various substitutes such as a box from which the ends have been removed, sand bags that are higher than the part they are to protect, or, for the feet and legs, a wide board that can

be fixed between the mattress and the foot-piece of the bed. When the clothes are raised from the body they do not inhibit the loss of body-heat as well as when they are in contact and therefore it may be necessary to take means to prevent the part becoming chilled. Sometimes a light-weight cover can be put over the part for the purpose or a hot-water bag can be used.

Rubber rings.—These are used to relieve pressure on a bony prominence. To prepare a ring for use, inflate it with air, small bulb pumps are sometimes provided for this purpose, when this is not the case, wash the outside of the valve thoroughly with lysol or green soap, and hot water, dry it, cover the valve with gauze, and blow into it until the ring is about half full of air, then still blowing slightly to prevent the exit of air, close the valve. The ring must never be filled sufficiently to make it firm and unyielding or it itself will cause pressure, on the other hand, it must contain sufficient air to hold the part it is protecting from the bed. After it is inflated, adjust its cover, this should fit snugly or it will wrinkle. Put it under the patient with the hole under the part from which pressure is to be removed, see that the valve projects from the free side.

Cotton rings.—These are used as substitutes for rubber rings for the protection of small parts such as the knees, heels, and ankles. To make a ring cut a square of cotton, roll it diagonally and make it into a ring the desired size, wind bandage around it and be sure that this secures the ends of the cotton firmly so that the ring will retain its shape. If necessary secure the ring in place with a bandage.

Sand bags.—These are used to (1) immobilize a limb, one being put on each side of the latter; (2) as a support, for example, a bag is frequently put against the feet of a

patient when lying on the back if there is a tendency to foot drop as is not uncommon in the aged, those who are debilitated by prolonged illness, in diseases of the spinal cord, and in poisoning by certain drugs, especially lead. Previous to use the bags should be rolled in towels.

Demonstration 20

Lifting and Elevating an Inflamed Limb

Reason for elevation.—The blood-vessels in an inflamed area are abnormally distended with blood and, consequently, there is an excessive exudation of fluid into the tissues of the part. As the result of this engorgement, there is pressure upon the nerve endings in the area and the consequent stimulation of some of these gives rise to pain. A common mode of treatment in some inflammatory conditions, when the affected part is a limb, is to fix it in an elevated position as this favors the venous flow more than the arterial and, therefore, tends to lessen the amount of blood in the part without interfering with the circulation and thus to relieve the pain. As a rule, the limb is also more or less immobilized, in some cases, because absolute rest is essential and, in others, because any movement causes pain and twitching movements, due to reflexes[1] occasioned by the pain, are common in such conditions.

Special points to be considered when moving and arranging an inflamed limb are: (1) Movement causes pain and therefore must be done carefully. (2) The whole limb should be supported while it is being moved and after it is in position. (3) As a rule the elevation should be gradual, and if it is a leg that is elevated the support

[1] What is meant by reflexes?

should be so arranged that it will afford a rest for the thigh also. (4) If the affected part is a leg, the covers should be held on a cradle as their pressure upon the foot will cause pain.

Requisites.—(1) Four ordinary-sized pillows and two small ones protected with rubber cases put on under the white ones; (2) a cradle (one with a flat top is to be preferred) or substitute; (3) a bandage; (4) white twine; (5) three safety pins; (6) two splints (one about six inches wide), the length of the patient's leg, and, if of wood, about one half inch thick, at one end there should be an upright piece for a foot rest and a hole about three inches in diameter where the heel will rest; also there should be a small hole in each corner of the splint, the second splint should be about the same thickness as the first and about the length of the patient's arm—both splints should be padded (see page 599); (7) safety pins; (8) three pads of sphagnum moss and non-absorbent cotton or wadding, two of these should be about 6 x 9 inches and one about 6 x 16. The latter should have a hole about two inches in diameter in the center, the hole should be enough smaller than that in the splint to form a padding between the interior of the latter and the patient's heel. One end of this pad should cover the foot rest and the hole should be over that in the splint. Also, if there is a wound in the under surface of the leg, there should be a hole in the pad where it will prevent pressure on the wound. It is well to pin the pad at the sides to the bandage covering the splint in order to keep it in place while the splint is being drawn into position.

Procedure in elevating an inflamed leg.—Arrange your equipment in the order in which you will need the articles and place them within easy reach.

Loosen the upper bed covers at the bottom of the bed

on the side of the affected leg. Turn them back neatly so as to expose this leg to above the knee.

Put the splint on the bed with its upper rim against the patient's foot.

Put your hand which is farthest from the patient's foot under her ankle and the lower part of her leg, and raise the latter sufficiently high—but not higher—to slip the splint under it, or else slip one hand under the ankle and the other under the knee; have your hands facing each other, and pass them as far under the leg as possible, and, as you raise the leg slightly, have an assistant move the splint into place. If there is a fracture make slight tension on the leg with hands above and below the point of fracture, in order to keep the ends of the broken bones apart.

Pass a doubled strip of gauze under the splint at each extremity and in the center and tie these around the leg.

Unpin the pad and arrange its ends so that they fit into the curves of the foot and around the heel and see that the pad protects the heel from the walls of the hole. Repin the pad to the splint covering at the sides if necessary. Another pad may be required between the splint and foot and one at the edge of the splint under the knee.

Place the pillows—two to four according to the degree of elevation required—lengthwise on the bed just below the foot that is to be raised, put one upon the other, but each one about three inches farther back from the edge nearest the foot so as to form an incline that will fit under the thigh.

Slip one arm under the splint from the top to the bottom and raise the leg, draw the pillows under until the nearest edge of the upper one comes under the knee.

If there is any part of the thigh not resting against the pillows, fill the space with small pillows or pads.

Put a piece of twine through each corner hole of the splint and tie the ends to the cradle. This procedure is sometimes omitted, but supporting the splint in this way makes it easier for the patient to change her position without moving her leg. If an ice-cap is used tie it to the cradle in such manner that the weight on the leg will be lessened.

To elevate the arm proceed in the same manner as for the leg, but a straight splint is used, and, as a rule, one or two pillows are all that are required and a cradle is only needed if an ice-cap is used. Unless conditions exist which make immobilization of the fingers necessary, the splint is only put under them as far as the knuckles. If the lower pillow does not extend into the axilla, fill the space with a pad.

N. B. Never attempt to move an injured limb by grasping the fingers or toes.

Demonstration 21

Undressing a Bed Patient on Admission

Requisites.—(1) 2 bath blankets, (2) a rubber sheet, (3) a subject on a stretcher.

Preparation of the bed for a stretcher patient.—Turn down the bedclothes, fanfolding them neatly to the foot of the bed; cover the bedding with a rubber and this with a bath-blanket; place a folded bath-blanket across the foot of the bed. This is drawn over the patient as soon as she is laid upon the bed, and is used as a cover while she is being undressed and bathed.

Procedure.—Lift the patient from the stretcher to the bed as in Demonstration 14. Cover her with the blanket.

To undress the patient.—(1) Unbutton the waist, remove the sleeve nearest you in the same manner as that

of a nightgown, if the waist buttons in front pass the loosened side behind the patient (to do this turn the patient on her side or, if this should not be done, pass your arm behind her shoulders, raise her slightly and, stretching across her, with your free hand draw the waist from under her); remove the other sleeve. If the waist buttons in the back remove it in the same manner as a short nightgown that opens in the back (see Demonstration 6). If one arm is injured the sleeve must be removed from it last.

2. Remove the skirts. To do this, unfasten them, flex the patient's knees if possible, draw the skirts down as far as you can, put one hand under the patient's thighs (inside the skirts) and raise her and, with your other hand draw down the skirts; lower the patient's thighs, pass your hand inside her skirts, under her legs, raise these and draw off the skirts. If drawers are worn they can be removed at the same time as the skirts.

3. Remove undervest and chemise together in the same manner as a nightgown.

4. For method of removing stockings, see Demonstration 18.

Sometimes, especially after accidents, it is necessary to cut some of the clothes in order to remove them without disturbing the injured part; when this is necessary, cut in the seams and injure the material as little as possible.

While undressing a patient notice if there are any abnormal conditions present, e. g., a rash, scratches, abrasions, swellings, edema, loss or impairment of motion; if there is evidence of recent loss of flesh, *i.e.*, a loose or wrinkled condition of the skin. Report any abnormalities and any information regarding her condition given you by the patient to the head nurse, and record

essential items on the chart which is prepared as soon as the work for the patient is finished.

In the case of a real patient a bath is usually given as soon as she is undressed, if one is not to be given, the nightgown is put on after the undervest is removed.

Demonstration 22

Care of Patient's Belongings

Negligence in the care of patient's clothes and valuables is a common source of quite unnecessary, because avoidable, trouble in hospitals. Therefore the pupils should pay very special attention to the details of this demonstration[1] and always put them into practice. As the arrangement for the keeping of the patient's belongings varies in different institutions the details also must be diverse, but all arrangements are based upon certain necessary precautions, viz., against loss or theft of the patient's property and against false claims made by the patients or their friends. Thus, in most institutions a clothes record which is usually either a book or a card register, is kept in the receiving ward or, if the patients are not undressed there, on each floor or ward or, sometimes, a supply of cards is kept in the receiving or general wards (wherever patients are undressed), but the register is kept in the main office and a card is taken there as soon as it is filled in. But, whatever the method, everything taken from the patient is listed. The nurse who undresses

[1] In order to guard against mistakes after the pupils have been shown their hospital system for the care of the patient's clothes, each pupil should be required to carry out the entire procedure. As this varies so greatly in different hospitals, it seemed better to give the general principles here rather than the minute details of any one method.

the patient makes out and signs this record, also the patient, if she is in fit condition, or, if she is not, a friend, if such is with her, or, if she is alone, a second nurse, and later, when the patient receives her chattels, she again signs the record, acknowledging their receipt; or, if they are delivered to someone other than the patient, the recipient must sign it. It is of course very essential to be sure that the person to whom the things are delivered has a right to receive them. The record is to show all that happens to the patients' belongings from the time that they are taken from them until they leave the hospital and, also, the names of all persons who have had anything to do with them.

Requisites.—(1) Enough articles of clothing to demonstrate methods of folding and hanging and search for lice, (2) a clothes record, and (3) whatever other articles that the institution's system necessitates the use of.

Procedure—Even before the patient is undressed, unless she is in poor condition, if she has not already deposited her money, etc., in the office, you should ask her or whoever is with her, if she has any valuables with her that should be taken to the office for safekeeping. If the patient is too ill to be bothered and there are no friends with her, go through her pockets or bag as soon as you have undressed her and remove their contents. Have some responsible person as witness while you do so (patients have made false claims of property lost, hence the need of a witness). N. B. *As soon as you take or receive valuables from a patient you are responsible for them until you deliver them to the person detailed by the institution to care for such things*, therefore, if you cannot dispose of them at once, lock them in a safe place or else keep them in your own possession. If you put them, for example, on a table and they are stolen or lost you will be

likely to be required to pay for them. *Never throw away even a scrap of paper that you take from a patient's pocket.* Have the person to whom you deliver this property sign the record.

As regards the clothes, remember that no matter how poor they are they are not to be crushed, if they are old, they are probably the best that the patient has and it is an unpardonable unkindness to do anything to them that will make them worse than they are.

Hang skirts, waists, dresses, trousers, and coats; fold under wear neatly and, unless a separate locker is provided for each person, tie them together and tag them, in such case tag all other articles (hats, coats, shoes, etc.), and inscribe the tag with the name of the ward or floor, the patient's name, and the date. Except when the locker is in the patient's room, write its number in the record book and if for any reason the clothes are changed to another locker at any time *do not forget to change the number in the record.* If the clothes are soiled send them to the laundry; if they are infected with lice, or if the patient has an infectious disease, envelop the clothes in a protector and send them to the sterilizing room and state in the record that you have done so. The means taken to insure the return of the clothes and their subsequent identification varies in different hospitals. In small institutions a duplicate list to send with the clothes may be all that is required, but in large hospitals further precautions are generally necessary, and a common custom is to attach tapes marked with the number of the ward or room and either the patient's name or number of the bed to which she is assigned.

When you undress a dirty patient, always examine the clothes for lice; they are, when present, likely to be in seams and gathers.

Cleansing Baths

Why necessary.—People who remain in bed may not look dirty but, nevertheless, they need baths quite as much as those who get up. The reasons for this are: (1) The skin, in addition to various other functions, serves as an excretory organ and though the excretions (sebaceous matter and perspiration) consist, especially the perspiration, largely of water, they contain organic substances which, if not removed by washing, decompose and give rise to an unpleasant odor and are conducive to skin lesions which are annoying to the patient and favor chafing. (2) Bathing stimulates the circulation of the blood in the capillaries of the skin and thus aids it in its various functions and lessens the tendency to pressure sores. (3) The majority of patients find a bath both refreshing and sedative.

Bath Temperatures

A bath with a temperature between:

55°	and	65° F.	is known as a cold bath
65°	"	75° " "	" " " cool bath
75°	"	85° " "	" " " temperate bath
85°	"	92° " "	" " " tepid bath
92°	"	99° " "	" " " warm bath
99°	"	112° " "	" " " hot bath

How many baths necessary.—The desideratum is a daily bath for all patients, but in many of the large hospitals it is impossible to give ward patients this many; private patients, however, and all very sick patients must be bathed this frequently and others at least twice a week. This being the minimum, every nurse should feel that no matter how busy she may be, a biweekly bath for each of her patients is not to be omitted.

The ideal times for patients' baths are (1) about an hour after breakfast and (2) just before bedtime. In the wards, however, the baths may have to be given at odd times as the other work permits, but at least one hour should intervene between the eating of a meal and the giving a bath, the reason for the delay being that the bath, by exciting cutaneous nerves, improves the circulation and increases the amount of blood in the skin vessels and, consequently, removes some of the blood which went to the digestive organs in response to nerve stimulation aroused by the taking of food. This action interferes with digestion because, if they are to function properly, the glands which secrete the digestive juices must have extra blood during the period of their greatest activity.

Tub Baths

Important points to remember in connection with tub baths are:

1. Junior nurses should ask permission of the head nurse or a senior before allowing a patient to have a tub bath either on admission or during the early stages of convalescence.

2. See that the bathroom is warm: its temperature must not be lower than 78° F.

3. See that the tub is clean.

4. Be sure that the patient has everything that she needs for her bath—bath towel, bath mat, face towel, wash cloth, nail brush, soap, bath blanket and clean clothing if necessary.

5. Fill the tub half-full of water about 96° F., usually not hotter. Let the cold water run into the tub at the same time as the hot. Never run the hot water in first,

especially, when preparing the bath for a child, for this has been the cause of many accidents.

6. Assist the patient undress, put a wrapper or bath blanket around her to avoid exposure. Remove this as she steps into the tub, give her support as she does so.

7. If, either because of disability or uncleanliness, it is necessary to help her with her bath, put a bath towel across the loins to avoid exposure. Be sure and help her if she does not look clean, to avoid offending her make some excuse for proffering your help, e.g., that you do not wish her to become tired.

8. If the patient feels faint while in the tub, let out the water and cover her with a bath blanket, do not attempt to lift her from the tub.

9. Even when a patient is able to take her own bath, do not allow her to lock the door nor leave her long alone without at least speaking to her to ascertain that she is all right.

10. If for any reason other than therapeutic purposes, the bath water is above 96° F., do not let the patient remain in it longer than ten minutes.

11. At the completion of the bath, unless the patient wishes otherwise and does not require help, put the blanket around her and, if necessary, give her some support as she steps from the tub; dry her thoroughly, keeping the blanket about her until the drying is completed.

12. As soon as the patient leaves the bathroom wash the tub and tidy the room.

Demonstration 23

Cleansing Bath in Bed

Equipment.—1. Something to protect the bed—for a bath given a patient on admission, the rubber and cotton

bath blanket which are put over the bedding before the patient is put on the bed answers the purpose, the patient usually, unless she is in poor condition, being bathed as soon as she is undressed; otherwise a cotton bath blanket, without the rubber, is sometimes used except when the patient is too ill to be turned or when the bath is given merely as a means of refreshing the patient, or when the bed is to be remade in which case a bath towel is often substituted, (2) a bath blanket to cover the patient, (3) a toilet basket—see page 62, (4) at least two towels—a face and a bath towel, (5) a washcloth, (6) a foot tub and (7) a basin each about one third full of water approximately 110° F., (8) two chairs, (9) a table, (10) if the bed is to be remade, the necessary clean linen.

Procedure.—1. See that the window near the patient's bed is closed and that the room or ward is warm.

2. Collect your equipment; place the chairs at the foot of the bed and arrange the other articles where you can reach them as you require them.

3. Replace the upper covers with a bath blanket as described in Demonstration 12, but draw them down over the backs of the chairs, instead of leaving them folded at the foot of the bed, so that the sheet may air while you are giving the bath; or, if the bath is given before the bed has been made, loosen the clothes at the foot and remove each article separately, taking it near its center, and hang it over a chair.

4. Draw the patient to the side of the bed and, if the under bath blanket is to be used, if possible, turn her on her side.

5. If the bed is to be protected with a bath blanket, go to the other side of the bed, taking the unused blanket with you, turn back the one with which you have covered

the patient enough to put it out of your way; gather up one side of the other blanket, cover the bedding with it, putting the gathers close to the patient's back; go to the other side of the bed; turn the patient over and pull out the gathers so that the blanket will cover the sheets on the side at which you are standing.

When this bath blanket is not used, protect the bed by putting the extra bath towel under the part that you are washing, moving it as required.

6. Remove the nightgown.

7. Proceed with the bath, washing in the following order: Face, ears, neck, arms, hands, chest, abdomen, back, thighs, legs, feet, pubic region. While working remember the following points:

(a) Make firm pressure.

(b) Unless the patient is very dirty there need be no exposure during the bath. If it is necessary for you to observe your work, expose only the part that you are washing at the time.

(c) After washing a part, dry it before going farther.

(d) Wash and dry the ears, between the fingers and toes, the axilla, and pubic region particularly well.

(e) Use the water in the basin for the face, neck, arms, and hands.

(f) Before washing a hand place a towel and (on this) the basin under it, then soak the washcloth with water and squeeze the water through the fingers; repeat this procedure after washing the hand with soap and then place the hand on the towel, remove the basin, and dry the hand. Treat the other hand in like manner.

(g) If the knees can be flexed and there is no reason why the feet cannot remain in water for a few minutes, put them into the tub before beginning to wash the thighs and legs. To do this: Flex the patient's knees, put the

tub on the bed near the feet, under the blanket, place your arm that is nearest the foot of the bed across the tub—see Fig. 35—this prevents the blanket getting into the water; put your free arm under the patient's legs and your hand under her heels; raise the legs and feet; draw the tub under them and lower them into the water. (This, like the rest of the bath, can be done under the blanket.)

To remove the feet: Fold the bath towel and place it on the bed at the far side of the tub; take hold of the feet and tub as before; raise the feet, hold them over the tub for a few seconds until the water stops dripping from them, place them on the towel; remove the blanket from above the tub; take the tub from the bed; dry the legs and feet.

(h) Turn the patient on her side before washing her back, if she is weak, this is best done by grasping the side of the blanket on a line with her shoulders and thighs and raising it upward.

8. Remove the lower blanket. Do this while the patient is on her side, move the blanket as far under her as possible, turn her on her back on a portion of the bed from which the blanket has been removed, draw the blanket from under her.

9. Cut and clean the finger and toe nails if necessary. Have a towel under them while you are doing so.

Admission bath.—Many patients admitted to hospitals are exceedingly dirty and a very liberal use of soap and water is required; for this reason, as already stated, protect the bed with a rubber and cover this with a bath blanket. When the patient is dirty, it is well, after washing the face, to put some ammonia in the water.

To remove machine grease from the skin, wash the soiled parts with hot alcohol. Heat the alcohol by put-

ting the bottle containing it in a sterilizer or basin of water and this over the flame which it must completely cover so that the flame cannot reach the alcohol, which is inflammable, put a piece of folded gauze or a towel between the bottle and the metal container or the former may break. (Why?) Ether and benzine will also remove grease, but, as a rule, patients do not like their odors. The alcohol should be brought to the bed with the rest of the equipment and kept in the hot water until required.

If the feet cannot be made clean by one washing, after the bath is completed, put a rubber covered with a towel under them, envelop each foot in a compress of gauze or a towel saturated with hot green soap solution, wrap the towel and rubber around them and let them remain thus for about an hour, then wash them again. To do this, raise the covers at the foot of the bed to about the knees, the rubber under them will serve to protect the bed. The use of sapolio and a nail brush may be necessary.

Lice.—If the patient is very dirty look for body lice. There are three forms of lice which infest the body, the head louse or *pediculosis capitis* which will be described later; the body louse known as *pediculosis corporis* or *pediculosis vestimenti*, and the *pediculosis pubis* or *crab louse.*

The body louse lives in the seams and gathers of clothing but feeds on the body, the signs of its presence are scratch-marks (made by the patient in an endeavor to overcome the itching)and petechiæ[1] produced by the bite of the insect. When such are present the clothing should be most carefully investigated and, if necessary, fumigated, and the patient's body should be washed with a disinfectant such as bichlorid 1:2000 before the regular

[1] What is meant by petechiæ? Why should the bite cause such a mark? See page 932.

cleaning bath, and the latter should be exceedingly thorough. Everything used for the baths should be disinfected.

The crab louse is a very small, gray, translucent insect that infests parts of the body, other than the head, that are covered with hair, as the pubic region, axillæ, eyebrows. The treatment is the same as for the body louse and, in addition, after the cleansing bath, a parasiticide such as sulphur ointment or ointment of ammoniated mercury should be rubbed into these parts. Only a small amount of the latter should be applied in any one place at a time.

Demonstration 24

Bathing Infants and Small Children

Proper temperature of room and water. Have the temperature of the room in which a baby is to be bathed between 75° and 80° F. The proper temperature for the water may be determined by the following table:

For an infant under three months.......	95° to 100° F.
For an infant three months and upward..	90° to 96° F.
For an infant one year................	85° to 90° F.
For an infant two years................	75° to 80° F.

Requisites.—(1) Rubber apron; (2) two washcloths; (3) two soft, warmed towels; (4) two small, warmed bath blankets; (5) a foot-tub containing water; (6) a small basin of very diluted warm soap solution, made from pure unscented soap; (7) powder; (8) infant's clothing; (9) a large doll that can be used for the subject.

An infant under three weeks of age is either bathed in the lap or by spraying; as a rule, a baby is not put into a tub until the cord is off and the umbilicus healed.

Procedure when the bath is given with the baby in the lap:

Put on the rubber apron.

Arrange the equipment where you can reach everything as you require it from your seat.

Take the baby in your lap and envelop it in a blanket, have the opening of the latter on the side nearest you.

Undress the baby.

Bathe first the face, head, and neck and then, in turn, the arms, chest, legs, back, buttocks, around the rectum and external genitals.

Wash each part with (1) very dilute soap suds; (2) clear water (use a different wash cloth) and then dry it thoroughly, but gently, before proceeding to another part. Do not expose the baby during the bath. Pay particular attention to the eyelids, ears, buttocks, and all surfaces where two folds of the skin come together. In little girls, separate and clean between the labia; in boy infants, once or twice a week, draw back the foreskin to see that there is no dried urine or other soil adhering to the penis. But a most important point to remember is. that though the external genitalia are to be kept clean, they are to be handled as little and as gently as possible, for stimulation of nerve endings caused by handling these parts during bathing may promote the desire to masturbate.

Put your left arm under the blanket and baby in a manner to adequately support the latter, draw the other blanket over your lap and put the baby down on this, discarding the other blanket. Bring the end of the fresh blanket around the baby and pass your hand back and forth over it so as to remove any remaining moisture from the baby's skin.

Powder the baby if necessary and dress it. Powder

helps to dry the skin and to prevent chafing where two surfaces of the body come together; its use, however, is seldom necessary except in hot weather. Never use much in any one part and use it only where it is necessary.

Procedure in giving a baby a tub-bath:

Put on the rubber apron and arrange your equipment.

Cover your lap with a blanket.

Hold the baby on your lap while you undress it.

When putting the baby in the tub, have your left wrist and hand under its head and shoulders with your thumb and little finger extending into the axillæ. Hold the legs with your right hand.

Keep your left hand in the same position during the bath and wash with your right hand.

Do not keep the baby in the tub more than two or three minutes.

When the bath is concluded, cover the blanket on your lap with a towel.

Take hold of the legs in the same manner as when putting the baby into the tub and raise it from the water, hold it for a second above the tub, put it in your lap, cover it with the towel and blanket. Rub gently over these. Take the other towel and finish the drying.

Endeavor should be made to have children like their baths, therefore, if a child does not, as soon as it is old enough to notice and desire a toy, put one or two floating ones in the bath water.

After a child is two or three years old conclude the bath by spraying her with water about 70° F., have the water in which she is standing about 80° F. The use of cold water in this way trains the child's system to react normally to cold and this tends to lessen any propensity to "taking cold." The nature of the body's reactions to temperatures will be found in Chapter IX.

Spray baths. In many hospitals bath tubs are no longer used for infants and small children, for it is thought that a tub which is used for a number of children may be a means of transmitting infection, and marble or tiled slabs sloping to a sink, with sprays to convey the water from the tank in which it is contained, have been substituted. As the slab is covered with a towel that is sterilized after

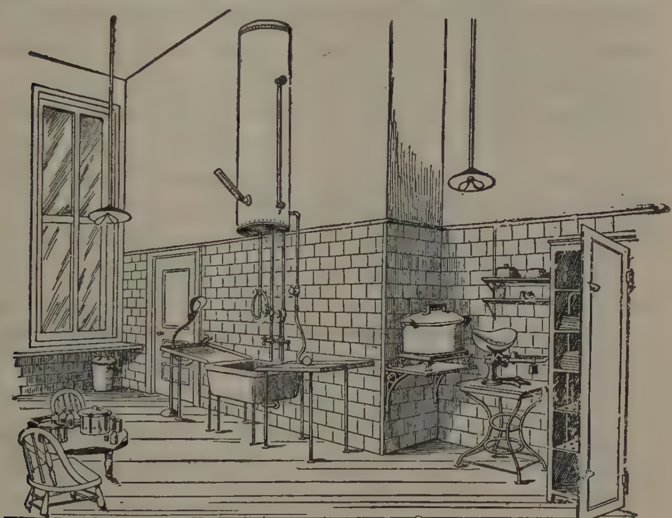

Fig. 24.

use, an infant does not come in contact with a surface that has been touched by another until it has been disinfected.

Figure 24 shows the arrangement used in the Presbyterian Hospital in the city of New York for this purpose. It consists of an eight-gallon copper tank, which is connected with the hot- and cold-water pipes. These terminate within the tank in four small points, those of the cold-water pipe pointing upward and those of the hot-

water pipe, downward. This arrangement causes the current of the two streams to go against their gravity tendency, and thus a thorough intermingling of the two streams is effected and the water in the tank is made of uniform temperature throughout. The flow of water into the tank is caused and discontinued by turning valves which are on the pipes a little above the sink. A water gauge on the side of the tank shows the depth of the water within the latter and a thermometer projecting from the front shows its temperature.

Each morning, at bath time, the tank is filled with water the required temperature (103° F.). This, it has been found, insures a spray with a temperature of 100° F., and this temperature is maintained within one or two degrees for from three to four hours.

The baby, after being undressed, is laid on a clean bath towel on the slab, sponged with soap suds and then sprayed with the water from the tank. It is then rolled in a warmed towel and blanket, dried and dressed.

After use, the washcloths and towels are washed and then (1) boiled in a sterilizer and (2) dried in a drier provided for these purposes. When dry they are folded and put away.

Care of the Hair

Aims.—Comfort, cleanliness, tidiness, to prevent or restrict falling of the hair.

Demonstration 25

Washing the Hair in Bed

If the hair of a woman patient is washed in bed it is best done after the bath is completed.

Requisites.—(1) Two small rubbers, (2) one rubber about forty inches wide and long enough to cover the pillows and extend into the foot-tub when the latter is on a chair at the side of the bed, or a Kelly pad; (3) three face towels, (4) one bathtowel, (5) a crushed sheet or newspaper to protect the table, (6) one large safety pin, (7) a quart pitcher of hot soap solution (about 110° F.), (8), a large pitcher of water of the same temperature, (9) a foot-tub or a pail, (10), hair-lotion or tincture of delphine or other parasiticide, (11) a large medicine dropper, (12) a small glass for the hair lotion.

Procedure.—Arrange the equipment: Put a protector on the table under the pitchers, place the foot-tub on a chair or stool near the head of the bed at the side at which you will stand while washing the hair, hang one face towel on a bar at the head of the bed where you can reach it easily.

Draw the patient to the side of the bed and turn her on her side with her back toward you.

Loosen her nightgown at the neck and turn it down.

Double a towel over one edge of a rubber, put these around the neck and pin the towel in such fashion that it will hold the rubber in place.

Move the top pillow from under, but just in front of, the patient's head.

Cover a small rubber with the bath towel and this with the large rubber arranging the latter so that it will extend about twelve inches above, below, and in front of the patient's head.

Put these under the patient's head with the small rubber undermost and covering the pillows, roll up both sides of the large rubber so that it forms a trough with one roll under the patient's neck, have one end covering the near portion of the pillow which was moved, and

which serves as a wall for the trough, and the other hanging free over the side of the bed.

Put one corner of a face towel between the patient's face and the roll of rubber and leave the rest of it free to cover her eyes and wipe her face with, if necessary, during the shampoo.

Undo the hair and spread it out in the trough.

Draw the chair with the tub into position and put the free end of the trough rubber into this.

Tell the patient to keep her eyes closed and put a corner of the towel over them.

Pour the soap solution slowly over the head, turning the latter as required, rub the soap into the scalp and through the hair as you proceed and, occasionally, discontinue pouring while you rub the scalp. When the soap solution is finished, pour some of the water from the large pitcher into the small one—as the latter is more easily handled—and pour this over the head, rubbing the latter with one hand as you do so.

When the soap has all been removed, squeeze the water from the hair, wipe the patient's face, neck and ears with the towel that you placed under her face, moving back the rubber at this point when you take away the towel; gather the hair into the towel, remove the trough rubber, letting it down into the foot-tub.

The patient's head is then on the bath towel. Dry the hair with this and the face towel.

When the hair is as dry as you can get it, saturate the scalp with hair lotion or, if there is any suspicion of the presence of lice, with delphine. This is most easily done by filling the medicine dropper with lotion and running the point of the dropper through the hair along the scalp forcing the wash from it as you go. If hair

Fig. 25.—Washing the hair.

lotion[1] is used, rub it into the scalp; the use of delphine will be described later.

Unpin the towel that is around the patient's neck, remove this and the rubber and use the former to replace the bath towel unless it is wet, in such case, use the towel that you hung at the top of the bed.

Fasten the nightgown, place your patient in a comfortable position, spread out her hair to dry. Fan it if you have time.

Put everything around the bed in order and remove your equipment.

Demonstration 26

Washing a Woman's Hair when not in Bed

Requisites.—(1) A large rubber, (2) two bath towels, (3) two small towels, (4) a safety pin, (5) a pitcher of soap solution, (6) a large pitcher of hot water if there is not a spray that can be attached to the faucet for the purpose, (7) a bottle of hair lotion, (8) a medicine dropper, and (9) a small glass.

Procedure.—Put a folded face towel around the patient's neck, cover one edge of the rubber with a bath

[1] A good hair lotion consists of ℞ Sodium bicarbonate 150 gm.
Ext. witch hazel
Alcohol 95% a.a. 835 c.c.
Water

This quantity is, of course, for the stock solution; only about 2–3 drams are used at a time, being poured when needed into a small glass.

When there is dandruff the following prescription is sometimes used:

Resorcin 10 gm.
Alcohol 95% 40 c.c.
Water 50 c.c.

towel, and pin this around the patient's neck outside of the other towel. Fold a small towel and put it on the front edge of the toilet basin. The patient can sit either with her back to the basin and rest her neck on this towel or facing the basin and rest her forehead on the towel. Give the shampoo in the same manner as when giving it in bed. When the patient is not in bed it does not, as a rule, make any difference if the shampoo is given before or after the bath.

Care of the hair if pediculi are present.—If a patient's head looks dirty examine it for pediculi[1] before giving the bath, pretend that you are combing the hair while you are doing so, so that the patient may not suspect your object and be offended.

The two common signs of pediculi are: (1) Itching of the head caused by the lice crawling on the scalp and puncturing it for blood, upon which they feed; (2) the presence of nits, which are the eggs of the lice. These look like dandruff, but they cling tenaciously to the sides of the hair, and dandruff is easily brushed off. If the lice have been present for any length of time there are likely to be eczematous lesions extending to the neck and behind the ears and, sometimes, some of the neck lymph nodes are enlarged.

If pediculi are present, before giving the bath, cover the pillow with a rubber and this with a towel[2]; take measures to prevent any of the parasiticide entering the eyes, usually the patient is asked to close her eyes and to

[1] The louse which infests the head (the *pediculus capitis*) is a gray insect from 1–2 mm. long.

[2] If the patient is to have a tub bath, saturate her head with the parasiticide using a medicine dropper, as previously directed, tie a towel around her head, and let her take her bath before washing her head. Otherwise, the treatment is the same as described above.

hold a folded towel or wash cloth over them; wet the scalp and the hair next to it thoroughly, as already described, with delphine or other parasiticide,[1] turn the towel around the head and either tie or pin it on the forehead. Leave it thus for about two hours (you can give the bath in the meantime) and then comb the hair with a fine-tooth comb, and afterward wash it as previously directed.

As soon as the hair is dry use some more parasiticide; if there are any nits on the hair, wash it, not the scalp, with hot vinegar.[2] To do this, spread the hair out on the rubber and rub it with a gauze compress saturated with hot vinegar, also draw the hair—taking small strands at a time—between a fold of the saturated compress. If the patient is not in bed, do this with her head bent over the basin as when washing the hair. After doing so flush the basin thoroughly with hot water.

A daily application of parasiticide and hot vinegar should be made until there are no signs of either pediculi or nits. If the head is very badly infested, especially if the patient is in bed, it is well to keep a towel or square of muslin bound around the head turban fashion.

Everything that comes in contact with the hair when in this condition should be put into a parasiticide, lysol or carbolic being good ones for the purpose, and after treating the hair, you should wash your hands with either lysol, carbolic or bichloride, scrubbing under the nails.

[1] Other common parasiticides used for this purpose are carbolic acid 1 : 40, lysol 2%, bichloride of mercury 1 : 2000, and kerosene (the odor and the danger of setting fire to the hair if the patient goes near a flame render kerosene objectionable).

[2] The outer surface of the nits is of a tough gelatinous nature which parasiticides cannot penetrate and, therefore they will not destroy the vital portion of the nits unless the coat is dissolved; it is for this purpose that the hot vinegar is used.

Demonstration 27

To Comb and Brush a Woman Patient's Hair

Only a dying patient should be considered too ill to have her hair cared for in the usual manner. If the hair is done daily and properly its arrangement will not entail any discomfort for the patient. If, however, it has been neglected, it is likely to be very tangled and, if the patient is very ill, the tangles may have to be removed by degrees. Occasionally, a very ill patient is admitted to the hospital with her hair in such a condition that it may have to be cut, because the disentangling and cleaning would need to be so extensive that it might exhaust her. This, however, must be avoided if possible and must not be done without the consent of the patient's friends and that of the hospital authorities, *not even if the patient desires it.*

If the hair is very tangled it will probably, to avoid tiring the patient, have to be put in order by degrees, the snarls being removed from a small portion at a time and this braided to prevent it becoming tangled. By doing this at intervals, working for about ten or fifteen minutes at a time, the whole head can usually be put in good order during the day with but little annoyance to the patient. Wetting the portion of the hair that you are disentangling with alcohol or hair lotion or rubbing a little vaseline or oil into it will help somewhat in freeing the tangles.

When a patient is very ill or obliged to keep quiet, the best way to do her hair, as a rule, is to part it right across the center of the head, from the forehead to the nape of the neck, and braid it in two plaits, making the braid on each side quite near the ear so that the patient will not lie on it. This fashion is usually the most comfortable

for the patient and it allows of the subsequent arranging of the hair being done without disturbing her. The hair should be attended to twice daily. This and massaging the scalp, using a little vaseline if it is dry, and keeping it clean will do much to prevent the hair falling. A good means of keeping the hair clean and thus obviating the necessity for frequent washings is the so-called dry shampoo, given as described later. Massage keeps the scalp loose and improves the circulation of blood through it, two essential things for the nutrition of the hair. A nurse on general duty does not have time to give massage frequently, but one doing special duty should consider it her obligation to do it, if necessary.

Requisites.—(1) Towel, (2) comb and brush, and, if a dry shampoo is to be given, (3) orris root, about 1 tablespoonful tied in a small piece of gauze, (4) a hair lotion about 2 drams in a small medicine glass, (5) a medicine dropper.

Procedure.—Place a towel, crosswise, under the patient's head so that it will cover this portion of the pillow and the patient's shoulder nearest you. Part the hair as described in the preceding paragraph and be sure to make the part clear, comb and then brush the strand of hair on the side at which you are standing. If it is tangled begin to comb at the free end and hold the hair between the tangle and the head while you are loosening the snarl. After brushing this strand braid it close behind the ear and be sure that the hair between the part and beginning of the braid is loose enough not to feel uncomfortable but not more so. Remove the towel, go to the other side of the bed and arrange the strand of hair on this side in the same manner.

For a dry shampoo, after parting the hair preparatory to brushing it, separate a thin layer of hair from one of the

strands, brush this well and then pat it on both sides with the bag of orris root, place this layer where it will not get mixed with the remainder of the hair, separate another layer and repeat the procedure, and so on until all the hair of this strand has been so treated. Then, put a very thin layer of absorbent cotton over the brush and press it in somewhat with the comb, brush a strand of hair with this (*the absorbent cotton takes up the orris root and with it the oily matter that the latter has absorbed*), fill the medicine dropper with lotion and squeezing the lotion from it, run it along the part of the scalp from which the orris root has been removed. Treat another portion of the hair in like manner; and repeat the procedure until all the orris root has been removed and the scalp, on this side has been wet with lotion. Then massage this portion of the scalp, comb the hair and braid it. Either go to the other side of the bed or turn the patient and treat the other strand of hair in like manner. During the shampoo change the absorbent cotton on the brush as often as necessary.

Care of the Mouth

Aims.—To keep the mouth clean and thus prevent infection of this and adjacent parts and injury to the teeth.

In the case of convalescent patients and those who are not seriously ill the care of the mouth is the same as in health; viz., the teeth are well brushed morning and evening and, when possible, after the midday meal. When people are very ill, however, especially if their temperature is high there is likely to be an insufficiency of the mouth secretions which, in health, tend to keep the mouth moist and clean. This may be the result of inactivity of the secretory glands of the mouth or of the rapid evaporation of the moisture on account of the high temperature.

Whatever its cause, if this condition persists for any length of time, the membrane will become very much dried and cracked and only the greatest care will prevent the collection of sordes.

Sordes consist of the residue of food (this includes liquids except water), dried epithelium, mucus, and bacteria. If sordes is allowed to accumulate, many serious conditions, both local and systemic, may result. For one reason, the sordes becomes so adherent to the mucous membrane that it is almost impossible to free it without causing the parts to bleed, and, if this happens frequently ulceration and inflammation will surely follow. Also, the presence of food residue and sordes in the mouth provides favorable conditions for the propagation of bacteria, which are always there, thus they are likely to multiply inordinately. The results of this depend upon the strains of bacteria present; for examples, if there are pneumococci, pneumonia may complicate the original disease; if there are pyogenic varieties, septic conditions of the mouth and infection of the cavities communicating with it and adjacent parts may result; thus inflammation of the middle ear (otitis media) is a common sequela of diseases such as typhoid when the mouth is neglected.

Usual régime in hospitals.—Twice a day, patients who can brush their own teeth are given their dental appliances. Some hospitals provide toothbrushes for patients who are without, others supply applicators, which consist of large-sized wooden toothpicks with a small pledget of absorbent cotton wound around one end; others, small squares of gauze which the patients wrap about one of their fingers. If the patients are not supplied with dentifrice, they are given either a small glass of mouth-wash or of water and the nurse squeezes a small (*about one half inch*) amount of tooth paste on to a

clean square of gauze or an applicator, but *never on the patient's toothbrush* if the tube is for general use. Patients in bed must each be also given a towel, a basin, and if gauze or an applicator is used, a piece of paper or other receptable on which to lay these after use.

General Instruction.—When a patient is too ill to do her own teeth, the nurse must do them for her. How often they need to be done will depend upon the existing conditions. Certainly, a sick patient's mouth will require a thorough cleansing three times a day and, probably more frequently if she has a high temperature. In such case it will also be necessary to wash the tongue and around the teeth after each feeding. A thorough cleaning should never be done after a meal for, if the patient is inclined to be nauseated, disturbing her then, especially if the back of the throat is touched, may cause vomiting. To avoid this it is also better to allow ten minutes to elapse between the feeding and the washing and to give the patient a drink of water before beginning, for this will help to wash the mouth, in fact, when the mouth is not very dry, it is sometimes all that is necessary. The removal of food residue after each feeding is important for it lessens the need for frequent thorough cleansings.

After the mouth of a fever patient is washed a lubricant is applied to the lips and any other part that is particularly dry. If a thorough cleansing is done just before a feeding, the lubricant is omitted until after the washing following the meal.

N. B. The mouth of a fever patient needs to be washed after feedings at night, as well as in the day time, but, if this is done regularly and the patient is given water frequently, one thorough cleansing during the night may be sufficient.

Mouth washes in common use are:—*Listerine diluted ½—¼ its strength with water; Dobell's solution likewise*

diluted; antiseptic solution (liquor antisepticus U. S. P.) diluted as above; equal parts of boric acid 2% and liquid albolene flavored with lemon juice; permanganate of potash ½—1%.[1] *Peroxide of hydrogen diluted with from two to three parts of water is used when the mouth is very dirty. Its use must be followed by that of one of the other washes.*

When there is salivation[2] *or a relaxed condition of the throat membrane, astringent mouth washes are often prescribed. Examples of these are: Potassium chlorate, 1:16; tannin and glycerine, 1:8; tincture of myrrh and glycerine, 1:4; silver nitrate, ½—1%.*

The lubricants in common use are: *Cold cream, boric acid ointment, albolene flavored with lemon juice, rose water or some flavoring extract. When the mouth is not very dry, glycerine and albolene, 1:2, flavored with lemon juice or rose water, is often used, but, even when thus diluted, glycerine is somewhat astringent*[3] *and, therefore, must be used with caution when the mouth is very dry. However it tends to soften sordes and therefore, when this exists, an application of a glycerine wash is often made an hour or so before time for a thorough cleansing.*

Demonstration 28

Thorough Cleansing of a Fever Patient's Mouth

Requisites.—(1) Towel, (2) tooth paste, (3) kidney-basin, (4) mouth-wash tray.[4] The tray holds a small

[1] This is an efficient wash and comparatively inexpensive, but it stains fabrics and though the stains can be removed with oxalic acid the process is likely to harm the material.

[2] What is meant by salivation?

[3] What is meant by astringent?

[4] In many hospitals a tray thus furnished is kept on the bedside table by each fever patient. The bottle and jars are washed and refilled daily, the glass is washed after use.

bottle of mouth wash; a small glass; two small covered jars, one containing small squares of gauze and wooden applicators[1] with absorbent cotton wound around one end,[2] and the other a lubricant; a flat enamel or glass dish to receive used applicators.

Procedure.—Wash your hands. Put a towel under the patient's chin. Pour just as much mouth wash as will be required into the glass.[3] Moisten the cotton of an applicator in the wash, squeeze about one half inch of tooth paste on to this; rub the teeth and gums above and below them with this, rub downward on the upper jaw and upward on the lower jaw (never toward the gums) both in front and behind, and back and forth across the teeth; if there are spaces between the teeth, pass the tip of the applicator through them.

Take a clean applicator, wet it, and wash the paste from the teeth. Then, using as many (but no more) applicators as necessary, wash the tongue, the gums, the inside of the lips and cheeks. Be sure and pass the applicator across the upper and lower parts of the gums at their junction with the lips. While washing the tongue, have the patient extend it as far as possible and hold it

[1] Thin strips of whalebone, being pliable, make much better applicators for this purpose than wood, but they are too expensive for general hospital use. When they are used, they are not, like wooden ones, thrown away after use, but the cotton is removed with forceps and after the applicator is washed, fresh cotton substituted. Wash your hands before putting on the clean cotton.

[2] The pledget of cotton should be of a size to make the tip of the applicator about the thickness of the little finger; if smaller than this it will not hold enough solution, if larger, it will not pass easily between the gums and the lips.

[3] If the mouth is very dirty, wash it with peroxid of hydrogen and remove this with some of the other wash before doing the teeth and then proceed as directed above.

between your first finger and thumb; have these covered with a small piece of gauze. Do not dip a used applicator into the solution; if you wish to rewet one, pour some wash over it, but do not waste the wash, all mouth washes are expensive.

If the patient is strong enough to rinse her mouth and gargle her throat, raise her head and let her take a mouthful of wash, lower her head, place a kidney basin under her chin, and, if she does not do so herself, turn her head in this direction when she is ready to eject the solution.

Dry the lips with the towel.

With a clean applicator, apply some lubricant to the lips and any other part of the mouth that may require it, *i. e.*, that is very dry. Do not use much lubricant in any one place in the interior of the mouth, for, if the patient is sufficiently conscious, she may find it disagreeable. If the cleansing is done shortly before a feeding, omit the lubricant until the wash after the feeding.

Demonstration 29

Washing the Mouth after Feeding

Requisites.—The same as for Demonstration 27 and, in addition, a glass of drinking water.

Procedure.—Wash your hands, give the patient a drink of water. Place the towel under her chin. Wet the applicator in the solution and run it over the tongue, palate, and teeth—before and behind. Do this as lightly as it can be done to remove the food residue and disturb the patient as little as possible. Rewet the applicator by pouring solution over it or use fresh ones as needed. Wipe the lips. Take a clean applicator and apply lubricant as in the previous demonstration.

Care of a Baby's Mouth

At one time it was the custom to wash even a healthy baby's mouth after each feeding, but it is now very generally considered that if everything put into an infant's mouth is clean and the child is in good health, it is not, as a rule, necessary to wash its mouth until the teeth appear. An infant's mouth, however, should be inspected daily and washed if necessary. If the child has a high temperature the same conditions are likely to arise as in later life and the same prophylactic measures must be taken, but with the greatest care, for the membrane of an infant's mouth is exceedingly delicate and easily injured by rubbing or the use of a strong mouth wash, thus vigorous cleansing may lead to exceedingly serious conditions. Wetting the nipple of the breast or bottle with sterile water or weak (about ½%) boric acid solution just before the child is fed helps to keep its mouth in good condition.

Demonstration 30

Washing a Baby's Mouth

Requisites.—The same as for Demonstration 27, but substitute a sterile finger cot and small pledgets of sterile absorbent cotton for the applicators and gauze and in addition to the mouth wash (which is usually sterile boric acid 1 or 2%,) have a small bottle of sterile water.

Procedure.—Scrub your hands thoroughly. If possible, take the child on your lap; in any case fix it with its head bent slightly backward so that you will be able to see into its mouth. Pour some solution into the glass. Wind a thin piece of cotton around your first finger and dip it in the wash. Open the child's mouth by depressing

its chin and wash the interior very gently. Take a clean piece of cotton and wet it with sterile water and let the child suck it. The sucking movements, by pressing the mouth membrane against the cotton, will do much toward cleaning it. Inspect the mouth; if it is not clean repeat procedures. Wipe the lips. Apply a lubricant if necessary.

To Give and Remove the Bed-Pan

As these proceedings cannot be very efficiently demonstrated in the class-room, it will be necessary for each pupil to be shown how to carry them out the first time that she has to do them for a patient, but in order that it may not be necessary to give so much instruction then that the patient will observe it, the pupils should be required to study this section and be given all essential information beforehand.

If the pan is cold, warm it. This is usually done by letting warm water run over it. Be sure that it is dry. Take it, a cover and toilet paper to the patient.

If possible, flex the patient's knees and place her feet firmly on the bed.

Place the pan on the bed, near the patient.

Put your hand which is nearest the head of the bed under the buttocks (stand, if practicable, at the side of the bed which will allow of this being your left hand); raise her and slip the pan into position. Make sure that it is well placed.

If the patient expects to have a defecation get two gauze compresses, a basin of hot water, and a clean bed-pan.

When the patient is ready to have the pan removed, if her knees are not flexed, flex them; arrange the bed

covers so that they will be out of your way, but do not expose the patient. If the patient is not able to use the paper do so for her. Put one hand under the buttocks and raise the patient as when giving her the pan. It is most important to do this for, if you neglect it, even when the patient can move easily without much help, the pan may be jerked and some of its contents spilled. Cover the pan at once.

If the patient had a defecation either put a clean bed-pan under her or else place a gauze compress under the rectum. The former is the better procedure, as all the parts surrounding the anus can then be well douched by squeezing hot water from a thoroughly saturated compress over them before they are washed. If the pan is not used, moisten a compress sufficiently to wash the parts, but not enough to wet the bed. Protect the latter with the dry compress. Use this to dry the patient.

Wash these compresses and keep them for the same purpose and patient.

If the defecation is very odorous, it is better to remove the pan before washing the patient.

Never empty a pan without noting its contents and if they have the slightest unusual appearance make careful examination and notify the head nurse. This will be further discussed later.

Demonstration 31

Preparation of a Patient for the Night

Requisites.—(1) Bath blanket, (2) basin containing hot water, (3) soap, (4) hand towel, (5) wash cloth, (6) kidney-basin, (7) toothbrush, (8) tooth paste, (9) glass of warm water, (10) comb and brush, (11), alcohol 50%, (12) talcum powder, (13) small whisk, (14) chair.

Procedure.[1]—Place the chair at the foot of the bed. Replace the upper bed covers with a bath blanket and draw the covers down over the chair so that the sheet may air.

Draw the patient to the side of the bed.

Loosen the nightgown at the neck.

Place the towel under the chin; wash and dry the face, neck, in and around the ears.

Place the towel so that one end will be under the basin when it is placed where one of the patient's hands can rest in it. Arrange the basin in such position and wash her hand, squeezing water from the cloth through the fingers. Dry this hand and then treat the other one in like manner.

Wash and then rub with (a) alcohol, and (b) powder the axillae, back, and hips, and any other parts necessary for the prevention of pressure sores or chafing.

Remove the pillows, shake, and then replace them.

Shake crumbs from the nightgown and then sweep them from the bed.

Treat the under sheets and rubber as described on page 70, if necessary, change the draw sheet.

Let the patient clean her teeth or, if she is unable, do this for her.

Arrange the nightgown.

Draw the patient into place.

Arrange the upper covers and, at the same time remove the bath blanket.

Be sure that the patient is comfortable.

Remove all appliances and tidy the surroundings.

[1] Before carrying out these proceedings in the ward, give the patient a urinal or bed-pan.

As the details of these proceedings have been described in previous demonstrations only their order will be given here.

The Restraint of Patients[1]

Aims.—To prevent patients injuring themselves or getting out of bed.

Important points to be remembered in connection with restraint are:

1. Restraint will, as a rule, aggravate a patient and increase mental excitement and any tendency to violence. As such conditions may be very harmful to the patient in many ways and are likely to prove fatal if states provocative of cardiac weakness exist, a patient is never to be restrained unless absolutely necessary and, except in extreme emergency, not without the doctor's permission.

2. No more restraint than necessary is to be used and it is to be made as little obvious as possible; for example, when a patient is running a high temperature she often, even though not actively delirious, imagines that she has to go home, or to work, etc., and, unless she is constantly watched, she may get out of bed; therefore, in such case, if the nurse cannot remain constantly with her, which is the thing to be desired, it may be necessary to apply very slight restraint as described under method 4 so that her movements will be retarded enough to give the nurse time to reach her before she gets up. A patient would hardly notice restraint of this kind, but if her hands or feet were tied, she might be terrified or made angry and, in consequence, her mental condition made worse. For another example, when it is necessary to restrain the hands do so only as much as the exigencies of the case demand; thus, if the restraint is to keep the patient from removing a dressing, it is better, as a rule, to

[1] The pupils should study the section on Delirium in preparation for this lesson.

apply it in such fashion that she can move her arms as freely as possible without reaching the dressing.

3. When a patient is insane or delirious, never consider that any restraint will be sufficiently effectual to allow of leaving her unwatched, for, under such conditions, patients are often temporarily exceedingly strong and very cunning in devising means of unfastening restraining appliances.

4. When restraining the arms and legs be careful not to make the apparatus tight enough to impede the circulation.

5. If the appliances used are not well padded and lined with a soft material, put some non-absorbent cotton or other soft stuff, between them and the skin, especially at the edges, otherwise chafing and ulceration may result.

6. If the patient is struggling keep constant watch to see that such padding does not become displaced or the restraint tightened.

7. Do not fasten the arms and legs in an uncomfortable position.

8. Do not fasten the restraint where the patient can reach the knot or buckle, etc.; if the appliance locks, do not lose the key or go off duty with it in your pocket.

9. If possible to avoid it, do not apply restraint over the chest and when a camisole is used arrange it loosely enough over this area not to interfere with free respiratory movements.

10. Never restrain one side of the body only, if it is not necessary to fasten both of the hands and feet, fasten one hand and the foot on the opposite side.

11. Feel the pulse of a delirious patient who is struggling against restraint frequently and watch her general condition carefully, for sudden death is a common result of this state, the extra work thrown upon the heart by

the violent movements producing conditions incompatible with its functioning.

The appliances commonly provided in general hospitals for the restraint of violent patients are: (1) the camisole or strait-jacket[1]; (2) leather cuffs which are of sizes to fit the wrists and ankles and are known as *handcuffs* and *anklets*. Substitutes for these are sheets, a strip of canvas for restraining the thighs, squares of gauze or soft muslin.

Demonstration 32

Methods of Restraining a Delirious Patient

Requisites.—(1) A camisole, (2) a pair of handcuffs and anklets, (3) four pieces of gauze, each about one

[1] A form of camisole in common use consists of a heavy, but soft, canvas sheet the width of, but about ten inches shorter than, the bed. It is made shorter than the mattress in order not to press upon the patient's feet. It has an opening for the head, and there are sleeves, each one of which has a long strip extending from its under surface that reaches, and can be fastened, to the foot of the bed; there are holes along the upper and side borders through which a heavy cord can be passed to lace the camisole to bars at the sides and top of the bed. There is a slit extending down about twelve inches from the front of the curve that comes next to the patient's neck so that this portion of the canvas can be thrown back when the doctor wants to listen to the chest sounds. There are eyelet holes on either side of this slit and it is closed by lacing with heavy tape. This should be done before a camisole is put away after use to avoid delay when it is needed, and also the cords with which it is laced to the bed should be attached one in a corner hole at the top, another at the bottom, and two on each side in holes near the center.

Another type of camisole, which is more convenient but less strong and, therefore, less commonly used, consists of two pieces; the upper one of these reaches to the beginning of the pelvis and the lower from the upper part of the thighs to the ankles. It is put on the patient in the same manner as a single-piece one.

yard square (4) two draw sheets or one sheet and one canvas thigh restrainer,[1] (5) four soft pads to fit under the handcuffs and anklets, non-absorbent cotton or substitute, (6) side boards, described under method 4.

Method 1

Restraint with a Camisole

As it is a difficult matter to apply restraint properly when a patient is struggling it is well for a pupil to be subject for this demonstration and, as soon as the manner of using the appliances is understood, to pretend to resist restraint.

Procedure.—It would be impossible to give a method of procedure that could be followed in all cases, but the usual order is about as follows:

Make sure that the cords are tied in the eyelets as described in the footnote page 156.

Let one nurse restrain the patient's legs (this, usually can be done most easily by grasping or leaning upon the thighs just above the knees), while two others put the opening of the camisole over her head and draw her arms through the sleeves.

Pass the top piece under the pillow and lace it to the bar at the top of the bed on a level with or below the mattress, while one assistant fastens the sleeve straps to the foot of the bed and the other continues to restrain the legs. Unless absolutely necessary, the sleeve straps should not be pulled down tightly enough to prevent the patient moving her arms to some extent.

[1] A strip of strong, but soft, loosely woven canvas, the width of the mattress and about twenty-seven inches wide with a two-inch hem around its four borders and heavily worked eyelet holes, about six inches apart, along its side borders.

Pull down the lower part of the camisole over the legs, under the sleeve straps; it should not cover the feet. Lace the sides to the side bars of the bed, beginning in the center and working toward the top and the bottom and tie the lower cords to the legs of the bed at the foot. By lacing the camiscle in this way either half of it can be undone without loosening the other part.

Method 2

Restraint with Handcuffs, etc.

The handcuffs are strapped around the wrists and the anklets around the ankles and the straps are locked or otherwise fastened to bars at the sides and foot of the bed. The precautions necessary in their use have been already stated. As a rule it is better to secure the hands first and, after fastening the anklets, to put a double sheet or a canvas restraint across the thighs and knees to prevent the patient making too strenuous leg movements and thus injuring her ankles, but do not, unless absolutely necessary, adjust the straps so closely to the bed that movement of the legs is prevented.

Secure the sheet which you put across the thighs by wrapping its side ends around the bar at the sides of the bed. To do this, pass one side of the sheet between the mattress and the bar, bring it around the bar, and shove its end under and again around the bar, under the first circle of the sheet. Have your assistant do likewise, at the same time, on the other side of the bed.

If the canvas thigh restraint is used, instead of the sheet, put the canvas across the thighs and knees, lace it to the bar at one side of the bed (while your assistant does likewise on the other), by twisting the cord around the bar before putting it into each successive eyelet hole.

Begin in the center and work toward the head and the foot. Put the cord through the holes at the upper and lower edges of the canvas twice and then pass them to the head and foot of the bed and tie them to the bars there or to the legs of the bed. This is to keep the canvas stretched and prevent it wrinkling.

In addition to the above restraint, that of the shoulders may be also necessary to prevent the patient sitting up and pulling too forcibly upon her wrists.

To do this, if there is no regular appliance, fold a sheet diagonally, take hold of one corner, and have your assistant take hold of the opposite one on the top of the fold. Twirl the sheet in opposite directions until the free corner is twisted around the fold and a straight band is formed.

Pass this under the patient's shoulders; bring the end of the sheet up under an axilla, while your assistant does likewise on the other side, pass these ends over the shoulders under the band, cross them under the pillow, and tie them to a bar at the head of the bed, on, or below, the level of the mattress.

Method 3

Substitute Squares of Gauze or Soft, but Strong, Muslin for the Cuffs and Anklets

Fold a square cornerwise and then turn the corner around the fold until a straight band is formed.[1] Make two loops, as in Fig. 26, forming the figure eight with both ends on top and extending in opposite directions; put the

[1] When a band is made in this way the material is on the bias and it does not become as tight as a straight piece does if the patient struggles. N. B.—A bandage should not be used for this purpose.

loops together and pass them over a hand; put a soft pad or piece of non-absorbent cotton or other soft material

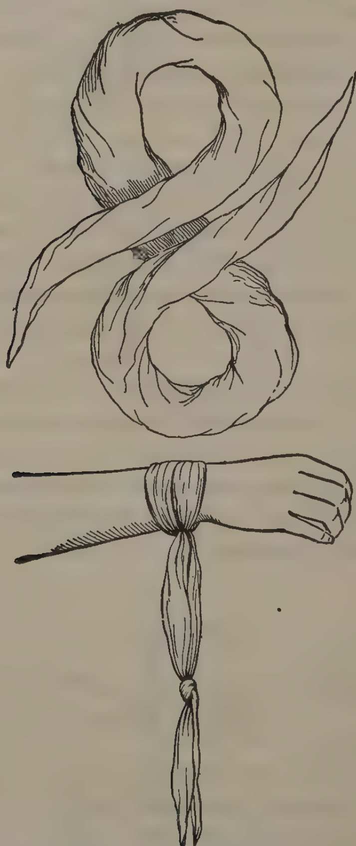

Fig. 26. Clove hitch.

around the part under the loops; draw the ends of the gauze until the loops are small enough to prevent the hand being pulled through, but not tight enough to inter-

fere with the circulation.[1] Tie the ends together about twelve inches from the wrist and then tie them to the bed. This method of tying is known as the *clove hitch*. The directions must be followed carefully, for if the loops are not properly adjusted, they will either become tightened and interfere with the circulation in the part or else they will not hold.

While you are tying one hand have one of your assistants secure the other one and have your second assistant restrain the legs as in Method 1, or, if you have three assistants, two of them can be tying the feet in the same manner as the hands.

Adjust the thigh and shoulder restraints in the same way as in Method 2.

Method 4

Types of Slight Restraint

As stated on page 154, a simple restraint that will only interfere with the patient's movements sufficiently to give the nurse time to get to her before she can get out of bed is often all that is needed. Two forms of such restraint are: (1) A sheet or canvas put across the thighs as described in Method 2; (2) boards, painted the color of the bed, about one inch thick, fourteen inches high, and the length of the bed, with either hooks or bolts which can be fastened to the bed or a hole in each corner through which a piece of cord can be passed to tie the boards to the bed. The boards are adjusted like the sides of an infant's crib.

[1] If it is too tight the parts below the restraint soon become a deep red. Even when the clove hitch is properly tied, the gauze may become somewhat tightened if the patient struggles violently and thus the color of the hands and feet is to be constantly observed.

Demonstration 33

Restraint of Children with Camisoles

Equipment.—Bradford frame, camisoles.

It can be easily appreciated that the precautions mentioned at the beginning of the section on restraint are especially important in the case of children, both because children are more easily excited and injured than adults and because it is very often necessary to apply some form of restraint when they are not delirious. In the latter case precaution two is of special importance for, if a child can move her arms and the restraint does not bind her uncomfortably, she usually soon becomes accustomed to it. If restraint is likely to be needed after operation it should be arranged before the child recovers consciousness as she is then less likely to notice it.

A light camisole, either with or without the Bradford frame, is probably one of the best means of restraining a child to prevent it getting out of bed or moving too freely. The camisoles generally used without a frame are about the same as those employed for adults, but, of course, smaller, and, as they do not need to be as strong, of softer canvas. Usually they, especially the one-piece ones, are without sleeves for they restrain the child's body sufficiently to allow of its hands being free.

The **Bradford frame** consists of a frame of two inches in diameter gas piping. Hospitals in which it is used are generally equipped with different sizes, for a frame should be just a little bit larger than the child for which it is used. The advantage of the frame for restraint is that, as the bars come nearer the child than do those of the bed, it is possible to adjust the camisole quite loosely across the body and yet get adequate restraint. The only

necessary difference in the camisoles used with the frame is that they are smaller, being required to fit the frame. They are laced to the frame as the others are to the bed bars. If the child is very restless or strong, tie the frame to the bed.

A good form of simple restraint for a child is that known as the *supinator*. It consists of a square, about ten inches, of doubled soft canvas, stitched around the edges and provided with four straps of strong, flat webbing, about two inches in width, which extend from the sides. Two of these straps are comparatively short being just about long enough, when the square is in position under the child's back, to go across the chest and buckle to the square at one side. The other two straps extend across,[1] and beyond both sides of, the square and one end of each strap is long enough to be passed under the bed and buckle to the shorter end at the side of the bed. If the straps need to be adjusted at all tightly around the chest, put a pad of soft material under them, and always fasten some soft material around the buckles.

Demonstration 34

Restraint of Child's Arm

Equipment.—Canvas yoke and sleeves, padded splint about three inches long, non-absorbent cotton, bandage, cuffs.

It is sometimes necessary to restrain a child's arm in order to prevent it pulling off its dressing or the like and various devices have been contrived for the purpose. Three very commonly used are:

[1] The webbing for these two straps is not stitched to the extreme edge of the square as the latter comes up slightly around the chest at the sides.

(1) A short yoke of canvas (which slips over the head) with sleeves. On the under surface of the sleeves are loops through which a cord can be passed. Each cord is tied to the side of the bed in such fashion that the child can move its arms as freely as possible without reaching its dressing.

(2) A well padded splint is bandaged to the anterior surface of each arm in such a way that the child cannot bend its elbows. N. B.—*Pad the edges of the splints particularly well.*

(3) Cuffs of pasteboard are tied around the upper arm in such fashion that they extend over the elbow and prevent the child bending the latter. Some soft material as flannelet, should be sewn over the edges of the cuffs or else a thin layer of non-absorbent cotton put between them and the arm.

Demonstration 35

Care after Death

The objects aimed at in deciding the details of this work were: (1) To arrange the body in a suitable position before *rigor mortis*[1] sets in; (2) to prevent unnecessary discoloration of parts of the body that show, especially the face; (3) to have the body clean and to protect it and anything upon which it is laid from post mortem discharges; (4) the easy identification of the body by the undertaker and others concerned; (5) the prompt notification of those who are to be told of the death.

Naturally there is considerable variation in the methods used in different hospitals, especially regarding

[1] What is meant by rigor mortis? To what is it supposed to be due? If unable to answer see in textbook of Physiology.

the notification of those concerned and the final disposition of the body and the clothes and valuables that the patient possessed. As failure to attend to details of routine procedure in this connection may cause much trouble and annoyance, the pupils should make special endeavor to remember all such information they are given with this demonstration.[1]

Requisites.—A sheet, a shroud, a piece of coarse or old muslin about one yard square, a pad of cotton waste, a little loose cotton waste, a four-inch bandage, two safety pins, two tags, vaseline, basin of water, washcloth, towel, comb, two pillows, unless there are two on the bed.

Procedure.[2]—Raise the head and shoulders on two pillows, this is to reduce the amount of blood in the head and thus prevent discoloration.

Close the eyes tightly and, to keep them closed, put a wet pledget of cotton over the lids.

Straighten the legs; put a little cotton waste against the rectum; fold the arms upon the chest.

If the patient had false teeth, put them in; close the mouth and, to keep it closed, take a doubled strip of four-inch bandage, put it under the chin, and tie it on top of

[1] The hospital rule regarding the summoning of friends and relatives when a patient is in danger of death is another point of the greatest importance for the pupils to understand and put into practice when occasion arises. The common rule is that the nurse in charge of the floor at the time, after getting the doctor's permission, notifies the office of the patient's condition. As a long time may elapse between the date of instruction and the need for some of the pupils to attend to this duty, it is likely to be forgotten unless its importance is sufficiently appreciated, especially as, when a patient becomes suddenly worse, there is usually a great deal of extra treatment to be attended to.

[2] In a real case, if the doctor is not present, word should be sent to him as soon as the patient stops breathing.

the head; bring it up behind the ears if possible to do so and keep the mouth closed[1]; place the rolled bandage under the chin; this is removed later, but it helps to keep the mouth shut and thus eliminates the necessity of tying the bandage tightly, which is to be avoided as it tends to produce discoloration.

Remove any rings or other valuables and see that they are at once disposed of according to the hospital rules.

Remove the covers, except one sheet.

If there is a wound replace soiled dressings with fresh ones, if there are drainage tubes or artery clamps, etc., in the wound remove them, take off marks of adhesive plaster with benzine or ether.

See that the body, including the nails is clean. In hospitals it is customary to bathe the body with soap and water, but, in private practice, it will sometimes be found that this and the arrangement of the hair is done by the undertaker's assistants.

Fold the muslin square cornerwise, put the pad in the center, and pass them under the buttocks (if the body is bathed this is done while it is turned for the bathing of the back); arrange the pad closely against the rectum, pin the square around the loins like a child's diaper.

Tie the legs together at the ankles and knees.

Put on the shroud.[2]

Lubricate the eyelids, and around the eyes and lips with vaseline.

Comb and arrange the hair.[3]

[1] Carrying out this demonstration with the hospital doll for a subject is a help to remembering procedure but does not give any idea of its difficulties. To get the mouth to stay closed, for example, is often a very difficult matter but it can and must be done.

[2] A nightgown would be substituted in private practice.

[3] The common custom in hospitals is to braid the hair in two plaits and tie these with a bandage, but, in private practice, the nurse is

Tie the arms together to keep them in position when the body is moved, do not tie them tightly however or they will become discolored.

Write the patient's name, the number of the ward, the date and the hour of death on two tags, and tie one to the bandage securing the arms.

Bring the top of the sheet down over the head, the bottom up over the legs, and the sides across the body. Pin in two places where the pins will hold the upper and lower, as well as the side portions of the sheet. Tie the second tag to the uppermost of the safety pins.

If the truck used for carrying the body from the ward to the morgue has not a cover, put another sheet over the body. Always see that there is no one in the corridor when a body is to be taken out.

Record the hour of death on the chart and, if there was anything unusual at the time of death, make note of it.

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likely to be requested to do the hair in the manner in which it had been ordinarily worn.

CHAPTER VII

Temperature, Pulse, and Respiration

Heat production, elimination, and regulation. Fever. Care of thermometers. Procedure in taking the temperature. Cause of the pulse. Different factors controlling the heart's action and the character of the pulse. Factors controlling breathing and the interchange of gases in the lungs and tissues in respiration. Conditions to note when counting the breathing. Abnormal types of breathing. Points to be considered in the keeping of clinical charts and records.

Body Temperature. Fever

In preparation for this lesson the pupils should read the sections in their textbook of Physics describing the nature and manufacture of thermometers, and the sections in their textbook of Physiology dealing with metabolism, heat regulation, and fever; for space here will permit the mention of only a few particularly essential points.

Temperature has been defined as the degree of hotness of a body measured according to some chosen scale.

The chief source of heat production or *thermogenesis* in the animal body is the oxidation of material derived from food that takes place in the body tissues, especially in the muscles and the secretory glands. Also small amounts of heat are derived from (1) the friction within the body caused by the movements of the muscles, circulation of the blood, and other internal activities; (2) the

hot foods and drinks that are taken; (3) by radiation, from sun and from fires.

Heat loss or *thermolysis* is effected chiefly through the skin, but there is a certain amount of loss through the lungs and with the urine and feces. The relative proportion of loss through these different channels under ordinary conditions is about as follows:

By radiation and conduction from the skin, 73.0%.
By evaporation of water from skin, 14.5%.
By expired air, 10.7%.
By urine and feces, 1.8%.

The evaporation of a liter of water requires 536 Calories[1] of heat, and a man loses about 930 calories daily in this way, about 530 of which are lost by evaporation of sweat and 400 by evaporation of the water leaving the blood through the lungs.

In health the chief cause of increased heat production is muscular exercise or increased muscular contraction from other causes, *e.g.*, shivering, while increased loss of heat is brought about by (1) dilatation of the skin blood-vessels, in consequence of which more blood is present near the surface of the body and loss of heat by radiation thus favored; (2) free perspiration. The nervous mechanism controlling thermotaxis (*heat regulation*) is so finely adjusted that, notwithstanding the constant variations in heat production brought about by body activity, and the constant changes in external temperature, there is ordinarily very little change in the body

[1] Calory is the term used to designate amounts of heat and this is estimated by the use of a calorimeter. What is known as the small calory is the amount of heat required to raise the temperature of one gram of water one degree centigrade and a large Calory (which is the one referred to above) is the amount necessary to raise one kilogram of water one degree centigrade.

temperature beyond a slight diurnal fluctuation, consisting of a slight increase toward evening, due to the day activities, and a corresponding decrease during the hours of rest.

In fever heat production is in excess of the normal relative degree of heat loss. The various theories regarding the physiological causes of the thermotaxic upset will be found in textbooks of Physiology.

The most common active causes of the physiological disturbances to which fever is due are (1) the presence of poisons in the body, especially those produced by micro-organisms; (2) interference with the loss of heat by environmental conditions. As previously stated, the external temperature does not ordinarily affect the body temperature, but if the former becomes excessively high, loss of heat by radiation will be interfered with and, if the humidity is excessive, the evaporation of sweat will go on more slowly than usual and loss of heat from this cause, be also reduced; therefore such atmospheric conditions promote the states known as sunstroke and heat prostration in which the body temperature may become very high.

Types of Fever.—The various kinds of toxins, etc., that give rise to fever affect the body in different ways and thus those causing different diseases produce characteristic symptoms, including a more or less typical course of temperature. According to the nature of the temperature fluctuations fever is classified as *continuous*, *intermittent*, or *remittent.*

A fever is said to be continuous when it remains constantly high with but slight variation in its diurnal fluctuations. Pneumonia, scarlet and typhus fevers are of this type.

In remittent fever, on the contrary, there is a moderate range between the highest and the lowest points, but the

temperature, until convalescence begins, is always above normal. Typhoid fever is of this type.

Intermittent fever is marked by very wide ranges between the fluctuations, the temperature alternately rising to about 104° F. or over, and then falling almost to, or even below, normal; malaria fever is of this type.

When judging of the severity of an infection or other abnormal condition by the temperature it is necessary to know the ordinary course of the temperature in that disease, for examples, a temperature of 104° F. is common in typhoid but would probably indicate a very serious condition in diphtheria, and many patients have recovered from a temperature of 112° F. resulting from heat prostration but, when the temperature reaches 106° F. as the result of bacterial infection, recovery is rare.

The terms used in describing different degrees of temperature is shown in the following table.

	Fahrenheit	Centigrade
Hyperpyrexia	106 and over	41
High fever	103 – 106	39 –41
Moderate fever	101 – 103	38 –39
Subfebrile	99 – 101	37 –38
Normal	98 – 99	36.5–37
Subnormal	97 – 96	36 –35.5
Collapse	96 – 95	35.5–35
Algid collapse	Below 95	35

There are three stages in the course of a fever, viz:

1. Invasion or onset, the period in which the temperature rises until it reaches its maximum. This may occur suddenly, as in pneumonia, or slowly, as in typhoid.

2. Fastigium, or stadium, the period in which, though there may be marked variations, the temperature remains more or less the same and repeatedly touches its highest point.

3. Defervescence, the period in which the temperature falls until it reaches the normal.

The period of defervescence may be very short, and the fever is then said to terminate by *crisis*, or it may be prolonged in which case the fever is said to terminate by *lysis*.

Concomitants of Fever.—By the concomitants of fever are meant the conditions usually associated with it. These are: increase in the pulse rate and breathing; thirst; either restlessness or apathy; headache and other painful sensations, such as pain in the joints and muscles; loss of appetite: coated tongue; nausea; vomiting; there may be either constipation or diarrhea; the urine is scanty, the face is usually flushed; the eyes are sometimes unusually bright, but, especially after the fever has endured for some time, they may be dull and blood-shot. Some of the fever concomitants are due to the high temperature, but most of them are also the result, directly or indirectly, of the toxins causing the high temperature.

Important Points to be Considered in the Care of Fever Patients.—1. Patients with fever must be kept at rest and, unless other conditions make it inadvisable, in the recumbent position. There are three very important reasons for this, viz.; (a) Movement favors the passage of toxins and bacteria from local processes into the blood and lymph streams and surrounding tissues and may thus help to spread the infection and increase the toxemia. (b) Activity increases the rate of destructive metabolism, and, during fever, this is already excessive, even when the patient is at rest. (c) Movement and even an upright position increase the rate of the heart's action and, during fever, it is constantly overworked and under conditions that hinder its action, since, when it is overactive, it does not get its usual supply of nutrient

fuel and oxygen. To appreciate these facts it should be recalled that (a) it is during the diastasis and diastole of the cardiac cycle (described page 180) that the coronary arteries fill with blood, while much of the blood is expelled from these vessels during systole (*contraction*) and it is the rest periods that are first shortened when the heart's action is increased. (b) Even when the heart's rate is normal the difference between the rate when an individual is lying down and active will spare it 21,000 beats per day and, of course, the difference is likely to be greater when conditions likely to accelerate its action exist.

2. Fever patients must be protected from excitement, either pleasurable or otherwise, for excitement, by stimulating the sympathetic system, tends to increase the rate of the heart's action and that due to disagreeable news is likely to promote worry and so prolong the sympathetic stimulation which, it will be remembered, also interferes with the peristalsis of the alimentary canal and the activity of the gastric glands and, therefore, with digestion, also it is likely to cause sleeplessness, restlessness, and sometimes delirium.

3. The bowels and kidneys must be kept active. Thus (a) cathartics or enemata are likely to be prescribed if there is not a free movement of the bowels daily; (b) a liberal amount of water must be given. It is usually best given frequently in small amounts, 1 or 2 ounces at a time. An abundant supply of water is necessary both to stimulate the kidneys and to dilute the bacterial toxins which leave the body chiefly through these organs and, if not highly diluted, may injure them. It is also needed to supply the body cells with water.

4. Cleansing baths are very necessary to stimulate the activity of the skin glands and to promote the expul-

sion of secretions from their ducts. If sebaceous secretion is retained in the ducts it favors the formation of pimples, boils, and the like. Baths also help to improve the skin circulation and thus to prevent the formation of bedsores. Cold baths are used for their stimulant effect upon the nervous system. The results of this are described in Chapter IX.

5. Proper care of the mouth is another very essential consideration when fever is prolonged. This is described in Chapter VI.

6. The diet. When the disease is one of short duration and the patient is troubled with nausea and vomiting, it is usually better not to force the feeding, in fact, a patient may be better without much food until the digestive upset is overcome. But in more protracted fevers, especially those due to bacterial infection, it is generally very essential to give adults enough food to furnish at least 2000 to 3000 calories per day and children the usual relative proportion in order to make up for the excessive metabolism and, by so doing, keep the patient well nourished and in a condition to combat the effects of the bacterial toxins on the system. Only easily digested foods should be used for, as secretion and peristalsis are usually depressed, digestive upsets are easily occasioned and often difficult to control. As a rule, during the fastigium the diet consists chiefly of liquid or semi-liquid foods such as: milk, milk preparations such as koumiss and matzoon, cereal gruels, meat broths, fruit juices, and foods such as jellied meat broths and cereals, ice cream and water ices, which, as they melt in the stomach, are practically liquid foods, also, if milk is allowed, junket can be used, because milk is converted into what is practically junket in the stomach and patients can often digest junket more readily

than the unchanged milk, also it is frequently easier to get them to take such bland soft solids than liquids, especially as they have to be given water so frequently. Lactose is often substituted for cane sugar for sweetening since it does not ferment quite so readily as the latter and, not being so sweet, a larger amount can be used and the caloric value of the food thus increased.

Demonstration 36

Care of Thermometers. Taking the Temperature

Requisites for Demonstration:

1. A clinical thermometer for the instructor and one for each pupil.
2. A tray with the equipment used when taking temperatures in the wards.[1]
3. A tray with an individual equipment.[2]

[1] (a) A common equipment consists of a tall glass with a pad in the bottom and sufficiently full of solution to cover the thermometers which it holds within one inch of their tops.

(b) A similar glass and contents for used thermometers.

(c) A colored glass with the same contents as (a) for rectal thermometers.

(d) A jar of vaseline.

(e) A jar with small gauze or cotton wipes.

(f) A small dish for used wipes.

(g) A book or pad and, attached with a string, a pencil. Each temperature is recorded in this book as soon as the thermometer is read, and, after all the temperatures have been taken they are copied from the book on the patients' charts.

[2] A tray, with one thermometer, either rectal or mouth, depending upon which is needed for the patient, a small jar of vaseline if a rectal thermometer is used, and a small jar of pledgets, is generally kept in each room intended for private patients and in the ward for patients who have infectious diseases.

4. A towel.

Care of thermometers.—When clinical thermometers are in constant use they are best kept in a disinfectant. Bichlorid of mercury 1–1000, is very commonly used for the purpose because it is an efficient disinfectant and it is odorless and almost tasteless. A soft thin pad of cotton is put in the bottom of the glass because the bulb of the thermometer is of very thin glass and easily broken. The disinfectant and pads must be changed and the thermometers washed twice daily. The glasses used to hold thermometers must be deep enough to allow of the disinfectant coming to within one inch of the top of the thermometers.

Thermometers used for taking rectal temperatures must be kept separate from those for the mouth and they should have some distinguishing mark.

The bulbs of the cheaper grades of thermometers generally used in hospitals gradually contract and the thermometers then register incorrectly. For this reason those in use should be tested weekly. This is done by putting them into a glass of hot water[1] (about 108°F.) with a thermometer that is known to be accurate, leaving them about three minutes and then comparing them with the standard. Those which show any considerable variation should be given to the head nurse. They can, as a rule, be returned to the makers.

Clinical thermometers are self-registering—*i.e.*, the mercury stays at the height to which it ascends until it is shaken down. Therefore, before using a thermometer, it is necessary to see if the mercury is down to 95° F. and if not to shake it down to that point.

To shake down the mercury, hold the thermometer

[1] The temperature of the water must not exceed the highest point of the scale on the thermometer.

between the thumb and the first and second fingers of the right hand, with the bulb pointing downward[1] flex the hand somewhat and give it a quick, sharp jerk. Be careful not to shake the mercury below 95° for if it all gets into the bulb it may not be possible to make it rise again. To try and make it do so, put the bulb into water about 108° F.

The temperature is taken in either the mouth, rectum, or axilla for these locations form more or less closed cavities in which large blood-vessels approach the surface. For obvious reasons, the temperature taken by rectum will be registered about a degree higher, and that taken by axilla about ½ degree lower, than that taken by mouth. It is necessary to leave the thermometer in place for a longer time when it is put in the axilla than when it is inserted in the rectum or mouth.

There is less chance of error when the temperature is taken by rectum and thus it usually is taken in this way when a patient is very ill, except when there are abnormal conditions of the rectum.

Procedure when taking the temperature by the mouth. Take the thermometer from the solution, wipe it,[2] shake it down if necessary, as just described, place it, in a slanting position, under the tongue. Tell the patient to keep her mouth tightly closed. Leave it in place three minutes. Remove it, wipe it, read it, put it in the glass for used thermometers.

[1] Do not let the bulb of the thermometer extend far beyond the hand, for, if it does, it may knock against something or the thermometer may slip from the hand.

[2] When the same thermometer is used for a number of patients a different wipe must be used for wiping it after it is removed from the mouth than before inserting it, or else a different wipe must be used for each patient.

Record the temperature.

If the temperature does not seem to accord with the patient's condition take it with another thermometer, and, especially if the patient is inclined to be hysterical, watch her for such patients often get an unduly high record by moving the thermometer in the mouth, holding it on a hot-water bag, and by various other means.

Report any abnormal temperature to the nurse in charge.

Points to remember.—A mouth temperature should not be taken within ten minutes of the time that the patient has had anything hot or cold in the mouth.

The temperature is not to be taken by mouth when the patient is coughing, has dyspnea, is unconscious, delirious, insane, or too young to understand what she is to do.

Do not leave the thermometer in the mouth longer than three minutes.

Should a patient bite the bulb off the thermometer, make her at once spit out the glass and mercury and be sure that no particles are left in her mouth. The physician should be notified. The danger attending this accident is that small particles of glass may be swallowed. Mercury in its metallic form is inert and, therefore, would probably do no harm, even if swallowed, but white of egg, which contains albumen, the chemical antidote for mercury, is usually given as a precautionary measure.

Procedure when taking rectal temperatures.—Shake down the mercury, lubricate the bulb, insert it gently into the rectum, for about one inch, pointing it slightly backward, and allow it to remain for three minutes. Proceed as when taking the temperature by mouth.

FIG. 27.—POSITION IN WHICH TO HOLD AN INFANT WHEN TAKING ITS TEMPERATURE.

If the patient is a small child hold it, if possible, face downward, across your lap, for it is easily restrained in this position and more likely not to need restraint than if it is in bed. As the axis of the rectum is changed when the child is in this position, the thermometer must be inserted pointing toward the umbilicus.

If the child remains in bed, it can lie either on its back or side; if it struggles, flex its thighs against the abdomen, keep one arm across its body and grasp it around its knees; hold the thermometer in place with your free hand.

Points to Remember.—The temperature is not taken by rectum following operation upon the rectum or when it is diseased. Never allow a very sick patient to insert the thermometer herself. If, when the thermometer is removed, the bulb is coated with feces, put a rubber cot on your finger, remove the feces from the rectum, and take the temperature over again for, if the bulb is embedded in a mass of feces it is the temperature of the decomposing fecal matter, and not that of the blood, which is obtained.

Procedure in taking the temperature by axilla.—Wipe the axilla with a towel. Shake down the mercury.

Place the bulb of the thermometer in the hollow of the axilla with the stem pointing toward the chest, bring the arm across the chest, and instruct the patient to hold it pressed closely to her body; unless she can do so without undue effort, keep your hand upon her arm.

Remove, wipe, and read the thermometer, put it in the disinfectant, and record the temperature at once.

Counting the Pulse

In preparation for this lesson the pupils should read the following sections in their textbooks of Physiology: The

structure of the heart and blood-vessels; the cause of the heart beat; the manner in which the nervous system influences the rate and force of the heart's action and the caliber of the blood-vessels; the influence of vagus and sympathetic stimulation and of changes in the caliber of the blood-vessels on the rate and strength of the heart action; common causes of sympathetic stimulation.

By the pulse is meant the expansion and contraction of an artery that can be felt by the fingers. The arteries expand when blood is forced into them from the ventricles as the latter contract. It is to be recalled that the blood flows into the auricles from the great veins and that, when the former are filled, they contract and force the blood into the ventricles which in turn contract and force the blood into the pulmonary artery and the aorta. The contraction of the auricles and ventricles is followed by their relaxation.

The alternate contraction and relaxation of the heart is known as a *cardiac cycle.*

The length of time occupied by a cardiac cycle depends upon the frequency of the heart beats. When this is between 70 and 75 beats per minute the time occupied by each phase will be about as follows:

Auricular systole 0.1 of a second
Auricular diastole 0.7 of a second
Ventricular systole 0.3 of a second
Ventricular diastole 0.5 of a second
Diastasis 0.2 to 0.3 of the diastole.

Thus there is about 0.4 of a second in which some part of the heart is contracting and an equal length of time in which it is not active, but is either relaxing or quiescent. Increased frequency of the heart action is attained first at the expense of the pause and then by

shortening the relaxation period, but, if the rate is increased to about 140 beats per minute, the time spent in contraction is also diminished.

Important points to remember in this connection are: (1) That it is chiefly during diastole that the heart muscle gets its necessary nourishment and oxygen because it gets these from the blood in the coronary vessels and, when the heart contracts much of the blood is forced from these vessels. (2) The pulse is increased by active exercise and even by change of position from lying to sitting and from sitting to standing. Even in health the pulse may be as much as five beats more per minute when sitting than when recumbent and ten more when standing. Thus, as previously stated, a patient's heart may be spared at least 21,600 beats a day if she is kept quiet. One reason for the increase in the frequency of the pulse by change in position is that when a person is in an upright attitude the blood has to be forced to the parts above the heart against gravity, which is not the case in the recumbent position.

The rate of the heart action is also increased by excitement, fear, anger, intense interest, etc., and if the pulse is counted while a person is under the influence of such stimuli an accurate knowledge of its actual rate will not be obtained.

Persons with nervous temperaments are likely to have a quicker pulse rate than those who are more phlegmatic, and as will be seen by the table on page 182 the pulse is normally more rapid in infancy than in childhood, and in childhood than in adult life, until about sixty years of age when it again becomes more rapid. It is quicker in the female than in the male and, as a rule, the pulse rate has an inverse relation to the stature being relatively slower in tall than in short people.

Acceleration of the pulse rate by natural causes as temperament, exercise, change of position, medicinal doses of drugs, is spoken of as *physiological frequency* and acceleration due to abnormal causes as *pathological frequency*. Continued frequency of the pulse from any cause is termed *tachycardia*.

Physiological infrequency or slowing of the pulse (*i. e.*, that due to natural causes) is not common but it is noted after fasting, it is normal in some individuals even in health, and it is produced by drugs which stimulate the vagus system and visceral muscle and those which act as nerve sedatives. If the infrequency due to drugs is excessive it is considered a pathological cause. Other pathological causes are mentioned on page 183. Infrequency of the pulse is termed *bradycardia*.

The average frequency of the normal pulse is as follows:

In men....................	67– 70	beats	per	minute
" women..................	65– 80	"	"	"
" children above 7 yrs.......	72– 90	"	"	"
" children 1–7 yrs..........	80–120	"	"	"
" infants..................	110–130	"	"	"
At birth...................	130–160	"	"	"

During fever the condition causing the rise of temperature will affect the circulation, by either or both direct action on the heart muscle or indirectly through the nervous system, but except in certain diseases there will be, so long as the patient is doing well, a fairly definite ratio of pulse to temperature which for an adult is about as follows:

For a temperature of	100° F.	a	pulse	of	80– 90
" " "	" 102° F.	"	"	"	100–110
" " "	" 104° F.	"	"	"	120–130

Exceptions to the rule are seen in scarlet fever, septicemia, exophthalmic goiter, hysteria, neurasthenia, and some forms of heart disease, in which, normally the pulse ratio is nearly always disproportionately frequent; and in yellow fever, myxedema, certain toxemias as uremia, some organic heart diseases, and diseases and injuries that promote pressure at the base of the brain and thus stimulate the vagus system, in which the pulse is relatively infrequent.

Any very considerable **disproportionate increase** of the pulse rate that cannot be accounted for by the conditions already mentioned is likely to be due to some such cause as collapse, shock, hemorrhage, or poisoning by drugs; even drugs which are used to slow the heart action may, in poisonous doses, have the reverse action.

Occasionally the arterial pulse will be very slow, about thirty a minute, while the auricles will be beating at the normal rate. Such a condition is due to what is termed *heart-block* and it results from defective conductivity of the bundle of His which prevents the ventricles being influenced by nervous stimulation, in which case their alternate contraction and relaxation is maintained by the calcium, sodium, and potassium salts brought to them by the blood. This may be brought about by over doses of digitalis and drugs with similar action, by infectious toxemias, and by local lesions of the bundle of His.

In addition to counting the pulsations of an artery, and thus ascertaining the frequency of the heart action, a nurse, when, to use the common expression, "taking the pulse" should note (1) whether it is regular or irregular, (2) its force, (3) if it is dicrotic, (4) if it is easily compressed or if the tension is greater than normal.

The normal pulse is regular in force and frequency

—*i. e.*, the pulsations are all of almost equal strength and the intervals between pulsations are of equal length. The pulse is likely to become irregular in either or both force or frequency when the heart is weakened from any cause. Another common form of irregularity is what is known as an *intermittent pulse*. By this is meant that, at either regular or irregular intervals, there is an intermission of pulsation due to failure of the heart to contract properly. When this occurs in the course of disease it usually indicates a relaxed condition of the arteries or a weakened heart, but it sometimes occurs in comparatively healthy individuals, especially the aged, and those who smoke a great deal or who are addicted to the excessive use of tea, coffee, alcohol, and drugs which affect the nervous system.

By the force of the pulse is meant its strength, whether it is strong or weak. The strength of the pulse beat is dependent upon the conditions influencing blood pressure.

To understand what is meant by a **dicrotic pulse** it must be known that upon each main pulse wave, as it

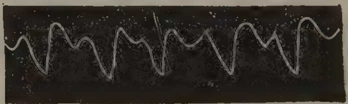

Fig. 28. Tracing of a dicrotic pulse made with a sphygmograph.

passes along the larger arteries, there is always superimposed a secondary wave, called the dicrotic wave. The latter is due to a rebound of the aortic walls caused by the sharp closure of the semilunar valves which suddenly stops the blood when it starts to flow back toward the relaxing ventricles. Normally, this dicrotic wave is so slight that it cannot be detected by the finger

when one "takes the pulse"; but, when the blood pressure is low for any reason (provided the arteries are still elastic, as in children and young adults) the secondary wave (following the closure of the semilunar valves) may become so pronounced that it will be readily detected as a weaker secondary beat quickly following the main pulse beat, and the pulse is then said to be dicrotic.

The tension of a pulse (hard or soft) is dependent upon **the blood-pressure**—*i. e.*, the pressure of the blood against the walls of the vessels and this is dependent upon (1) the strength of the heart beat; (2) the elasticity of the arteries; (3) the resistance offered to the flow of blood through the vessels; (4) the amount of blood in the vessels; (5) to a lesser extent, the viscosity of the blood.

Naturally **the pressure is reduced** when (1) the heart action is weak, (2) the blood-vessels are relaxed; or (3) the quantity of blood in the vessels is reduced. **The pressure is increased** above normal (1) when the elasticity of the arteries is reduced, as in arteriosclerosis,[1] (2) when conditions exist, such as disease of the kidneys, heart or liver, which interfere with the venous circulation; (3) by sympathetic stimulation, such as is induced by anger, fear, and the like; and, (4) as a rule, in fever except when it is prolonged.

The arteries become less elastic as age advances, and, therefore, the pressure normal at different periods of life varies. As a rule women have a slightly lower blood-pressure than men.

Blood-pressure may be roughly estimated by the amount of pressure that is required to arrest the pulsation at, for example, the wrist when the fingers are pressed upon the radial artery. If it is easily compressed, the pressure is low, if hard to compress, the pressure is high,

[1] From two Greek words signifying hard arteries.

but the character of the pulse wave and **the degree of blood-pressure can only be accurately determined with** the aid of special instruments such as the sphygmograph and the sphygmomanometer.

The essentials of a sphygmograph *are (1) a mechanism that will be set in motion by the pulsation of the artery over which it is placed; (2) an attached stylus; (3) a plate covered with carbon paper that can be set in motion under the stylus. The latter is moved in keeping with the pulsations of the artery and registers its movements by lines on the carbon paper. The tracing made by a sphygmograph is called a sphygmogram. It gives information regarding the rhythm (regular or irregular), amplitude and dicrotism of the pulse.*

There are several types of sphygmomanometers used for determining blood-pressure. A variety in common use consists of (1) an elastic bag outside of which is a leather cuff; (2) a mercury manometer (Fig. 29), which is connected with the elastic bag by means of rubber tubing, and also with (3) an air pump.

This is adjusted and used as follows: The elastic bag, covered with the cuff, is strapped around the arm at the heart level and then, by use of the pump, inflated until no pulsation can be felt at the radial artery. The height at which the mercury stands is then read and this represents the maximum or systolic pressure. The pressure on the arm is then reduced, by liberation of some of the air in the bag, until a large bounding pulse occurs[1]*; the height of the mercury when this happens marks the diastolic pressure, i. e., the pressure that the blood is exerting on the walls of*

[1] Sometimes the diastolic pressure is judged by the oscillations of the mercury rather than the pulse. In such case the pressure is released until the widest oscillations of the mercury column are obtained and the lowest position of the mercury meniscus is taken as the diastolic pressure.

the blood-vessels during diastole. this naturally is not as great as the systolic.

Another variety of sphygmomanometer that is much used has, in addition to the parts enumerated in the other

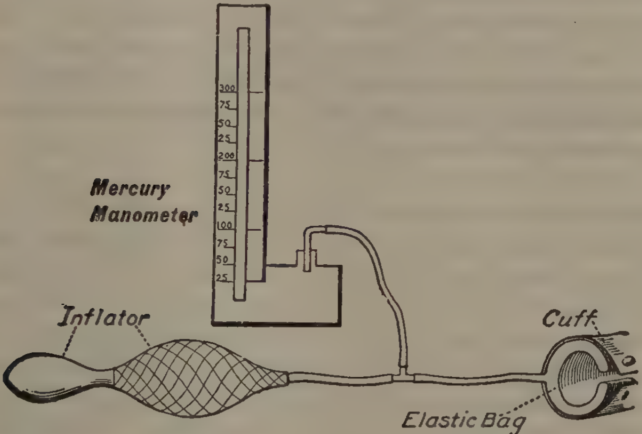

Fig. 29. Sphygmomanometer.

type, a stethoscope. The disc of the stethoscope is placed over the brachial artery in the bend of the elbow and is held in place by the lower edge of the cuff. The ear-piece the examiner puts in his ear and the pressure, instead of being judged by feeling the radial pulse, is judged by the sounds heard, thus, as the bag is inflated, the level immediately below the top of the mercury column when the first sound is heard gives the diastolic pressure. As the inflation of the bag is increased the sounds first grow and then decrease and finally, when the vessel is closed, cease. After a few additional squeezes of the pump, the air is allowed to escape slowly and the mercurial level (minus 1 mm.) when the first sound is heard gives the pressure.

The scale of the manometer is marked in millimeters (mm.) and thus the degree of blood-pressure is stated as being the number of millimeters that it raises the mercury in the manometer.

Systolic pressure is the greatest pressure which the contraction of the heart causes in the artery used for the test and **it shows** the force of the heart action.

The average normal systolic pressure in the arteries at different ages as registered by the sphygmomanometer is about as follows:

For the first few months	70– 75*mm*. Hg.
1– 2 years	80– 90*mm*. Hg.
2– 3 years	90–100*mm*. Hg.
3–10 years	95–115*mm*. Hg.
10–15 years	100–115*mm*. Hg
15–20 years	105–128*mm*. Hg.
20–30 years	135*mm*. Hg.
30–40 years	140*mm*. Hg.
40–50 years	142*mm*. Hg.
50–60 years	154*mm*. Hg.
60–70 years	180*mm*. Hg.

Diastolic pressure is the lowest point to which the blood-pressure drops between beats (*i. e.*, during diastole) and it **is an indication of** the degree of resistance against which the heart has to work.

So-called **pulse pressure is** the difference between the systolic and the diastolic readings; *e. g.*, if the systolic pressure is 135 mm. and the diastolic 110, the pulse pressure will be 25. The proportional relation of the systolic and diastolic pressure to each other and, therefore, the pulse pressure, **is an indication** of how well the heart is overcoming the resistance and thus it shows

how well the heart is driving the blood to the periphery, it also shows if there is hardening of the arteries for, in such case, the pulse pressure is abnormally high. Pulse pressure is subject to alterations by variations in (1) the energy of the heart; (2) the peripheral resistance, (3) the elasticity of the blood-vessels and (4) the quantity of blood circulating.

What is spoken of as the **co-efficient of pressure is** obtained by dividing the pulse pressure by the systolic pressure. This, like the pulse pressure, is a mathematical means of deciding the ratio of force and resistance and it is said to give an idea of the efficiency of the heart's action. The normal co-efficient is 0.33 to 0.25 and a co-efficient of or below 0.20 means a weakly acting heart.

Water-hammer-Pulse.—An abnormal condition of the pulse that it is well for nurses to know about is that termed *water-hammer-pulse* or *Corrigan's pulse.* The first name was given it because it is characterized by a quick powerful beat which suddenly collapses. The pulsations can be seen in the carotids and frequently in the brachial arteries. The conditions which give rise to the pulse are due to disease of the heart which allows of regurgitation of blood from the aorta. The force of the heart is due to the large quantity of blood forced into the aorta by the enlarged ventricle; and the sudden collapse is the result of failure on the part of the diseased valves to hold the blood in the soria.

Pulsation in some of the large veins, more especially the jugular and those on the back of the hand, is sometimes seen as the result of abnormal conditions of the heart, relaxed arteries, or severe anemia.

Occasionally **pulsations in the capillaries** can be detected when a person has heart disease, exophthalmic

goiter, or severe anemia. It is seen most easily in the lip if it is blanched by pressing a glass slide upon it. A nurse would not be expected to recognize a capillary pulse; it is merely mentioned as a matter of interest.

Demonstration 37

Counting the Pulse

Requisites for demonstration:

A watch, with a second hand, for each pupil.

A pad and pencil for each pupil.

A stethoscope.

A sphygmomanometer.[1]

The members of the class act as subjects for each other.

The pulse can be counted and its character observed on any large artery that is above a bone[2] where it approaches the surface. For examples: (1) The radial arteries at the wrist, on the thumb side; (2) the facial arteries where they pass over the lower jawbone, which is about on a line with the angles of the mouth; (3) the carotid arteries on the side of the neck; (4) the temporal arteries, a little above and to the outer angles of the eyes; (5) the femoral arteries, where they pass over the pelvic bones; (6) the dorsalis pedis on the dorsum of the foot.

Precautions: Do not "take the pulse" when the patient is excited or other conditions exist which will

[1] It is well for the pupils to learn to count the apex beat with the aid of the stethoscope.

Though the blood pressure is usually taken by the doctors it is well for nurses to have some idea how to use the sphygmomanometer.

[2] A firm background against which pressure can be made is essential.

cause temporary changes in it, except for the purpose of noting the results of such conditions upon it, see page 182.

Do not use your thumb to feel a patient's pulse for there is a superficial artery in it and you might feel your own pulse instead of the patient's.

Do not make too strong pressure when counting the pulse for, if the pulsation is weak, strong pressure will obliterate it—this is a common fault of beginners.

When taking the pulse at the radial artery, let the patient's arm rest on the bed or a table or against her chest as shown in Fig. 30.

When taking the pulse of a patient for the first time always take it in both wrists to ascertain if it can be felt equally well in both for, sometimes, owing to an unusual distribution of the arteries, or of some pathological condition there is an appreciable difference in the quality of the pulsations in the two arteries.

When the pulse seems slower than it should, count the apex beat, preferably using a stethoscope. Reasons for this have been already given. The beat of the apex of the heart will, normally, be heard about an inch below and to the left of the nipple.

Procedure: See that the patient is resting comfortably.

Take your watch in one hand and place two or three fingers over the artery, making slight pressure; observe the general character of the pulse. Count the number of beats occurring in one minute. If there is any suspicion of irregularity of frequency, count four quarters (noting the point on your watch where you begin each quarter) as well as for the whole minute at once; because, for example, if there are sixteen pulsations in one quarter and twenty in another, it will show irregularity of frequency.

Record the rate and if there is any abnormal condition of the pulse make a note of it.

Respiration

In preparation for this lesson the pupils should read the chapter in their textbook of Physiology devoted to description of the organs concerned with breathing and the physiology of respiration.

Respiration is said to be the *sum total of the processes by means of which the body obtains oxygen and gets rid of the carbon dioxid produced in its tissues.* This includes: (1) The mechanical movements of breathing; (2) the passage of oxygen from the alveoli of the lungs into the capillaries, its union there with the hemoglobin of the red corpuscles and the elimination of carbon dioxid from the capillaries into the alveoli. These processes are known as *external respiration;* (3) the passage of oxygen from the blood into the tissues and the passage of the CO_2 that has been produced by the union of oxygen with material in and of the tissue into the blood and lymph-vessels. This is termed *internal respiration.*

Breathing consists in the alternate expansion and contraction of the chest walls and the lungs. The expansion movements, by means of which air is drawn into the lungs are known as *inspiration* and the contraction, which forces out the air, as *expiration.*

It will be recalled that **the main factor in maintaining the breathing** movements is a small mass of gray matter in the medulla known as the respiratory center and that the CO_2 in the blood passing through this center is its chief constant stimulus, but that it is also affected by certain drugs, products of defective metabolism, etc., by afferent impulses; and by a deficiency of oxygen in the blood.

Therefore, **increase in the frequency of breathing** (*polypnea*) **will be brought about by** (1) conditions that increase the CO_2 content of the blood, *e. g.*, muscular exercise, fever, and other conditions that increase the rate of metabolism and any great increase of CO_2 in the air; (2) anything that lessens the oxygen intake, *e. g.*; inflammatory conditions of the lungs or air-passages or, obstruction in the latter; deficiency of oxygen in the air; low atmospheric pressure such as exists at high altitudes; a deficiency of hemoglobin in the blood, *i. e.*, anemia (*the amount of oxygen that can be absorbed by the blood depends chiefly upon the degree of atmospheric pressure and the amount of hemoglobin in the blood*); a deficiency of circulating blood as the result of shock or hemorrhage; (3) conditions which interfere with deep breathing, as abdominal inflammation and tight corsets; (4) drugs which stimulate the respiratory center; (5) afferent stimuli such as pain.

Decrease in the rate of breathing is usually due to: (1) Depression of the respiratory center as by opium and other narcotics, the toxins present in the body in uremia, diabetes, and the usual so-called fatigue poisons; (2) during sleep, catabolism and, consequently, the formation of CO_2, being then diminished; (3) pressure upon the center as when there is cerebral inflammation, hemorrhage, or fracture; and (4) the intake of an extra amount of oxygen; if, for example, a long breath is taken, it will be followed by a temporary arrest of the breathing, a condition known as *apnea*.

The depth of the inspiratory movements is generally proportionate to the frequency of the breathing, being shallow when the breathing is frequent and deep when it is slow. If conditions giving rise to pain in the abdomen, lungs, or other respiratory organs, or the chest wall exist,

the breathing will become particularly shallow and frequent, unless complications having the reverse effect are also present.

As a rule, men and children breathe more deeply than the majority of women, but this is thought to be due to difference in clothing and to habit, rather than to any physiological difference in the sexes.

There is a popular idea that deep breathing improves the aëration of the blood, but this is not necessarily the case, because shallow breathing is usually more rapid than deep breathing and, therefore, as much air can be obtained by moderately shallow breathing as deep, slow breathing. If, however, the breathing becomes abnormally rapid and shallow very little of the inspired air may reach the lungs. Though deep breathing does not necessarily increase the body's oxygen supply it is nevertheless to be advised because it favors the movement of air throughout the lungs and tends to improve the circulation and thus it increases the vitality of the cells and makes them more resistant to disease. By deep breathing is implied the normal rhythm that physiological conditions establish when muscle tone is normal and the movements of the thorax are not restricted.

The usual normal rate of breathing is as follows:

Men....................	16 to 18	per	minute
Women..................	18 to 20	"	"
Children................	20 to 25	"	"
Infants..................	30 to 35	"	"

The usual ratio of the breathing to the pulse is about one to four. This ratio is common even in fever except when there are some additional causes for disturbance such as those previously mentioned.

Conditions besides frequency and the depth of the breathing movements that are to be noted are: (1)

Whether or no all parts of the chest expand equally (in pneumonia, for example, when the consolidation is on one side, the chest will expand less on that side than the other); (2) if the breathing is quiet or forced and, in the latter case, if any particular muscles are brought into play more than others; (3) if pain is associated with the breathing; (4) if any of the following abnormal conditions are present.

Dyspnea, by which is meant difficult or labored breathing. This may or may not be associated with changes in the rate of breathing. It is brought about by conditions, either external or internal, that interfere with the required amount of oxygen being taken into the blood and carried to the tissues. It is usually associated with cyanosis. When dyspnea is so severe that the patient is unable to breathe in a recumbent position the condition is known as orthopnea.

Cheyne-Stokes breathing[1].—This is seen most frequently in patients suffering with kidney and heart diseases, arteriosclerosis, meningitis, coma, and following injury to the brain. It is a particularly serious symptom in the three conditions mentioned last. It has been noted also in perfectly healthy children during profound sleep. It appears in two forms. In one, the respirations gradually increase in force and frequency up to a certain point and then as gradually decrease until they entirely cease, a short pause ensuing before they begin again. In the other, likewise, the respirations gradually increase in force and frequency, but they cease suddenly instead of decreasing gradually. This phenomenon may continue for some time. The causes of Cheyne-Stokes respiration are as yet imperfectly understood.

[1] So called from the two physicians who first drew attention to this form of breathing.

Edematous breathing.—This must be noted the minute it begins, for it is not only a serious symptom, but an exceedingly dangerous condition. It is brought about by infiltration of serum from the lung capillaries into the air sacs. Anything which seriously interferes with the circulation of the blood in the lungs may bring about the condition. It is recognized by characteristic, loud, moist rattling râles caused by the air passing through the fluid in the air sacs. It is always associated with dyspnea and cyanosis.

Stertorous breathing.—This is not necessarily a serious symptom; it is due to a relaxed condition of the soft palate and is characterized by a deep, snoring sound in connection with each inspiration. It is nearly always present in apoplexy and in this condition the cheeks puff out with each breath.

Demonstration 38

Counting the Breathing

Requisites for demonstration.—The same as for counting the pulse.

Point to remember.—The method and frequency of breathing can be to some extent, at least for a short time, controlled by the patient and somctimes, even without intention, this will be done when the individual knows that her breathing is being counted; therefore, do it, if possible, without the patient's knowledge. A good way of doing so is to count the breathing either before or after the pulse and to pretend to be counting the latter while you are counting the breathing movements.

Procedure.—Place your fingers as when counting the pulse, hold your watch where you can see its second hand

FIG. 30.—COUNTING THE PULSE AND BREATHING.

and the patient's chest at the same time. Count an inspiration and expiration as one breath. Count for one minute.

Demonstration 39

Charting

Requisites for each pupil:

1. A blank clinical chart and a record sheet.
2. A small blotter.
3. Two penholders with fine pen points.
4. Black and red ink and other colors if necessary.
5. Blank charts, records, history sheets, and any other forms used in this connection in the hospital.
6. Sample charts, etc.

Procedure.—After the use of the various records and charts have been explained and samples investigated by the pupils, each pupil should copy a chart and at least one page of a record. Those who cannot print should practice at every opportunity until they can do so quickly and neatly. It is now an almost universal custom in hospitals to require the use of printed, rather than written, type of letters for they are more legible and even people who cannot write legibly will, with a little practice, acquire the knack of making small square letters such as the following:

a b c d e f g h i j k l m n o p q r s t u v w x y z

When recording the temperature, etc., make the dot at the desired point and then, using the ruler if necessary, draw a line between it and the preceding point.

Points regarding records that should be remembered.—The purposes of charts and records: (1) To let the

physician know what the patient's condition has been in his absence and provide him with the means of comparing the patient's condition from day to day and the effects of different medications or treatments. (2) To provide a record that can be kept indefinitely to be used if wanted for statistics and similar purposes or in case of law-suits. These purposes explain the reasons for many of the other points here mentioned.

Records must be neat, with no erasures.

The printing or writing must be legible, but the lettering should be as small as is consistent with legibility.

Statements are to be brief; no unnecessary words being used, it is, for example, quite unnecessary (though often done) to begin each, or even any, remark with "The patient."

Statements must be free from all ambiguity.

Each observation should be recorded in a separate paragraph.

Statements must be accurate and unless things have been actually weighed or measured definite weights, etc., should not be stated, but the amount should be recorded as being about or approximately so many c.c. or gms. etc.

Record all symptoms both objective and subjective (See Chapter VIII).

Record all medication and other treatments and the time at which they are given. If employed to relieve any condition that should be ameliorated in a short time (*e. g.*, headache, sleeplessness, pain, tympanites) record the result and state as nearly as possible how much time elapsed before the drug, etc., was effectual. If the treatment is such that its effects will only show after continued use—*e. g.*, a tonic—watch for results and make a daily statement of the change in the condition that is being treated.

When recording treatments, such as hot baths, that may have a bad effect, state something of the patient's condition during the treatment.

When recording the results of irrigations, douches, and the like, state whether or no the return flow was clear or contained foreign matter and the nature of the latter.

When recording the dressing of an open wound make a note of the presence or absence of discharge and the nature of the latter and general condition of the wound. Always ask whoever dresses the wound what report you are to make.

If a patient vomits record the approximate amount of vomitus, its color, and if it has any of the other characteristics mentioned under the section on emesis in Chapter VIII.

Observe and record with special care the nature of the excreta or of discharge from diseased parts; *e. g.*, the sputum, when the trouble is in some part of the respiratory track; the feces, when it is the stomach and intestines that are diseased; the urine, when some part of the urinary system or metabolism is at fault.

When it is necessary to measure the urine it is generally required to also measure and record the amount of liquid given.

The urine is generally measured and the result and the time the urine was voided recorded in all the following circumstances: If the patient has any disease of the urinary organs or of the heart or blood-vessels, or any disturbance of metabolism; when there is any suspicion that the patient is not excreting enough urine or if she has to be catheterized; if the urine develops any abnormal appearance; whenever the patient is very ill, or has even a mild attack of any disease, as scarlet fever, that is likely

to lead to kidney complications; for the first twenty-four hours after operation and longer if any of the complications already mentioned develop.

Catamenia should be recorded and note made of any distress if such is caused.

CHAPTER VIII

Symptoms

Nature of symptoms. Methods of physical examination. Significance of symptoms that it is of special importance for nurses to note. Nature of blood tests and functional tests. Use of vaccines in diagnosis.

Symptoms have been defined as *signs or evidence of disease or of change in a patient's condition.* Conditions that are complained of by the patient, but are not evident to the examiner, are termed *subjective symptoms*, those manifest in any way to the examiner are classed as *objective symptoms.* Conditions that are observed early in a disturbance, as during the period of incubation of an infectious disease, are called *prodromal symptoms.* Symptoms, such as fever and restlessness, that cannot be ascribed to any definite locality are termed *general* or *constitutional symptoms.* Those which result from abnormal conditions in a particular organ or part are referred to as *local*, *topical*, or *focal symptoms.* A group of symptoms that usually occur together in certain abnormal conditions is spoken of as a *syndrome* or *symptom-complex.* Conditions discovered by the methods classed as physical examination are spoken of as *physical signs.*

The methods employed in physical examination are: (1) Inspection or visual observation, used to note the general condition of the body and any visible evidence

of faulty nutrition, change in contour, the presence of swelling, rash, abnormal expression, or color of the skin, condition of the eyes, ears, etc., in fact, any visible departure from the normal. (2) Manipulation or the handling of parts to ascertain if any abnormal limitation of movement exists. (3) Mensuration or measuring, employed chiefly to discover inequalities on the two sides of the body; it is used more especially after fractures. (4) Palpation, or examination by touch, to determine the presence of (a) tenderness; (b) departure from the normal in the vibration or *fremitus* that is induced by movements of the organs in the cavities and by such acts as coughing, breathing, etc.; (c) variations from the normal in the degree of firmness of the tissues; (d) the presence of tumors; (e) fluctuations which indicate the presence of fluid in a part. (5) Auscultation or listening to detect the nature of sounds within the thoracic or abdominal cavities. In describing certain sounds arising from abnormal conditions of the valves of the heart, or of the blood-vessels (as aneurysm), or conditions of the blood such as exist in severe anemia, the term *murmurs* is used; and many of the abnormal sounds heard in the lungs are called *râles* (*from a French word meaning rattle*); examples of these are dry râles heard chiefly when there is some bronchial obstruction; moist râles, caused by the presence of liquid in the tubes; crepitant râles, a crackling sound heard especially in the early stages of croupous pneumonia; subcrepitant râles, fine moist râles heard in conditions associated with fluid in the bronchioles of the lungs; mucous râles, caused by bursting of viscid bubbles in the bronchial tubes. What are known as *friction sounds* are produced by sides of inflamed membranes, as those of the pleura and pericardium, rubbing upon each other. (6) Percussion or striking parts

with sharp, short blows produces sounds of varying resonance which are of aid in determining the thickness of underlying structures, the elasticity of the tissues, and the presence of fluid.

Other common measures employed for the detection of abnormal conditions of the body are: The use of appliances such as the thermometer, cardiograph, sphygmomanometer, etc.; the examination of excreta with the unaided eye, with the microscope, and with chemical tests; the microscopical and chemical examination of the blood, pathological secretions and specimens of tissue; röntgenoscopy, or examination by means of the X-rays; vital function test.

The symptoms that nurses are held responsible for ascertaining and reporting are visible physical changes; alteration in the temperature, pulse, and breathing, abnormal conditions of excreta, vomitus, etc., that can be seen without the aid of a microscope; those complained of by the patient.

It is really marvelous how little the majority of people observe unless they take the trouble to cultivate the habit of noting their surroundings and for many reasons it is most important that nurses should do this; two reasons as regards symptoms are: (1) unless signs of abnormal changes are recognized early treatment may not be started in time to save the patient's life; (2) the physician makes his diagnosis and bases his treatment upon the symptoms that occur and for knowledge of many of these he must depend upon the nurse.

The more common objective and subjective symptoms that it is important for nurses to note and their possible causes are as follows:

Changes in the odor of the breath, those that it is especially important to observe are: a sweet odor, usually

due to diabetes; an odor of urine, common in uremia; a fetid odor: this may be due to decayed teeth, rhinitis, tonsillitis, or to purulent or degenerative disease of some part of the respiratory tract, or to gastric disturbances.

Chill, which is an attack of involuntary contraction of the voluntary muscles, is brought about by over-stimulation of nerve centers. The stimulation may be of psychic origin, or the result of exposure to cold, or the effect of poisons, and the latter may be either taken into the body, *e. g.*, drugs, or formed within the body by bacteria, or as the result of defective metabolism or of imperfect elimination. Points regarding a chill to note and record are: its severity, duration, and effect upon the temperature, pulse, and respiration.

Convulsions are of the same nature as chills, but the muscular contractions are more violent. Like chills they are usually due to intense stimulation of nerve centers and, with the exception of exposure to cold, the same kind of stimuli that cause chills will produce convulsions. As a rule, a convulsion will point to a stronger stimulus than that occasioning a chill, but a stimulus that will cause adults to chill will promote convulsions in children, because their nervous system is much more readily stimulated. Other common stimuli that promote convulsions are: pressure upon nerves or nerve centers and, especially in children, reflex irritation such as may be induced by the presence of undigested food in the stomach or intestines, worms in the intestine, teething, adenoids, adherent prepuce, etc.

In some cases, *e. g.*, strychnine poisoning, convulsions are due to over-irritability of nerve centers, rather than excessive irritation, for very slight stimulation will give rise to a convulsion, and in the condition known as

idiopathic epilepsy, convulsions often occur unassociated with any definite discoverable cause.

Convulsions in which the contractions are intermittent are termed *clonic convulsions* and those in which the contractions are long continued are said to be *tonic*. Convulsions may be either general or local; the latter are sometimes termed *spasms*. Sudden attacks of convulsions occurring as the result of a temporary cause (*e. g.*, convulsions in pregnancy and those in children produced by the irritation of worms or food) are termed *eclampsia*. Convulsions due to abnormal psychic conditions are termed *hysteric convulsions*. These usually resemble those of epilepsy, but, unlike the latter they are rarely attended by loss of consciousness, and there is no tendency to bite the tongue, nor to pass urine involuntarily.

Points to record concerning a convulsion are: whether it is general or local and, in the latter case, the part or parts involved; whether tonic or clonic; the duration of attacks; if there was loss or retention of consciousness during the attack; whether the eyes were affected and in what way; effect upon the color, pulse, and temperature; whether there was frothing at the mouth or other abnormal condition.

Changes of color should be noted for they are typical in many conditions and it is especially important to observe a relatively sudden pallor for this is an indication of hemorrhage and shock. Progressive pallor involving the nails, ears, conjunctiva, and mucous membranes will occur as the result of reduced hemoglobin, with or without a reduction of red blood cells, and as the result of poor circulation; also various peculiar forms of pallor are seen in morphine and cocaine habitués, malignant diseases, nephritis, leukemia. In Addison's disease, the skin is

brown or yellow and it is also yellow when there is bile in the blood and tissues (jaundice). A flushed skin may indicate fever; a particularly bright red color of the cheeks or dusky red in patches is often seen when there is a pathological condition of the mitral valve of the heart; a unilateral flushing of the face is common in lobar pneumonia involving only one lung; a florid blotchy complexion frequently results from continued overindulgence in alcoholic beverages; a bluish or purple tint—termed cyanosis—is associated with improper aëration of the blood; this may be due to many causes since it may result from any condition which interferes with breathing or the pulmonary circulation, or from any great reduction of hemoglobin or acidosis. In silver poisoning—known as argyria—the skin assumes a peculiar bluish or gray color

Coma is a state of prolonged unconsciousness from which the patient cannot be aroused. It is a sign of severe depression of the nervous system.

Coughing is usually a symptom of irritation in some part of the respiratory tract, but it is sometimes the result of stimulation of nerves with centers proximal to the vagus. Two coughs that are of special importance to recognize are the hoarse *crowing* cough of croup and the more or less convulsive cough, followed by a whoop, that is characteristic of whooping cough. Points of special importance to note in connection with a cough are if it is associated with pain, the location of the pain, and if there is expectoration.

The nature of a child's cry and accompanying actions are often of diagnostic value. The normal cry of a healthy baby is loud and strong; if due to temper, the cry will be usually accompanied with kicking of the legs and stiffening of the body and the infant will cease crying

when it gets what it wants; when the cry is provoked by hunger it is generally continuous and fretful and the child is likely to suck its fingers and cease crying when it is fed; when caused by pain, a cry is usually sharp and strong and accompanied by signs of distress such as contortion of the features and, especially when the pain is due to colic, drawing up of the legs; the cry of illness is generally moaning and feeble, but in cerebral diseases such as meningitis and hydrocephalus, there is likely to be a typical strong, ringing cry.

Cyanosis; see under color.

Delirium may be induced by, and thus is a symptom of, conditions that prevent the cerebrum functioning properly. Common causes are: (1) The action of alcohol upon brain tissue, or that of the toxins produced by bacteria or those formed during metabolism and not eliminated; (2) lack of blood in the brain; (3) insanity.

Delirium may be manifested by great mental excitement and the patient may be extremely violent, strong, and noisy, or the delirium may show chiefly in inability to recognize surroundings (*defective orientation*) and the possession of irrational ideas; the patient is likely to be more or less restless and to want to get out of bed but, unless opposed, is neither very excited nor violent. When delirium occurs in the course of exhausting diseases, such as typhoid, the patient is likely to talk a great part of the time in a low, muttering, unintelligible manner. Delirium may occur suddenly or it may come on gradually, the patient growing constantly more restless and, when the condition is due wholly or in part to alcoholism, possessed of terrifying ideas. Such symptoms should always be noted and reported for the violent and exhausting delirium of alcoholism (*delirium tremens*) can often be averted if treatment

is started in time. Delirium tremens is particularly likely to occur in pneumonia and following accidents when the patient has been addicted to the overuse of alcohol.

Dizziness or vertigo is common in the following conditions: neurasthenia; states which induce anemia of the brain; intoxication with alcohol or autogenous poisons; diseases of the middle ear, especially of the semicircular canals; pressure upon the ear drum by wax or other foreign substance; eye strain; subjection to unusual forms of motion—this probably causes vertigo as the result of its effect upon the eyes and the lymph in the semicircular canals.[1]

Dropsy, see Edema.

Dysphagia or difficult swallowing is usually due to either inflammation of the throat; stricture of some part of the esophagus such as is caused by cicatrix or pressure upon it by tumors; hysterical spasm of the esophagus; paralysis of the muscles of deglutition. The last-mentioned condition is a common complication of diphtheria and regurgitation of food is a primary symptom, therefore whenever this happens it should be reported.

Dyspnea; for this and other symptoms connected with breathing see Chapter VII.

Edema is the term applied to abnormal collections of serous fluid in tissue spaces and dropsy is used to denote collections in body cavities. Edema may be localized or it may exist in almost all parts of the body. Its more common causes (and thus the conditions of which it is a symptom) are: diseases of the viscera (chiefly the heart and liver) which interfere with the venous circulation;

[1] Where are the semicircular canals and what is their function? If unable to answer read the section on the middle ear in textbook of *Anatomy and Physiology*.

interference with the venous circulation by the pressure of tumors, thrombi, etc.; nervous conditions which interfere with normal innervation of the circulatory organs; the retention of fluid in the system because of failure of elimination by the kidneys; lessened absorption of lymph, which is usually the result of poor circulation; increased permeability of the capillaries; changes in the composition of the blood. Collection of fluid in the body cavities (dropsy) may be due to the same causes as edema and it may also occur as the result of inflammation of the membrane lining the cavities or the contained organs. The parts of the body in which edema and dropsy are of greatest danger to life are the throat, lungs, and pericardial sac. In the early stages of disturbances which cause edema this condition may not be very marked or it may only show at times and thus is likely to escape notice unless the nurses are observant.

Eruptions on the skin occur from many causes. A characteristic rash is one of the most reliable diagnostic symptoms of the diseases classed as exanthemata; a rash is also a symptom of overdosing by certain drugs. Urticaria or similar eruption is often caused by certain proteins as those in antitoxin sera, and even those of some foods will cause urticaria in some individuals, as will also irritation of the gastro-intestinal, pulmonary, and genito-urinary mucous membranes. Some of the more common types of lesions occuring in connection with eruptions and skin affections are: Macules—*small discolored spots (usually either brown, white, or red) that are neither elevated nor depressed;* erythema—*a morbid redness of the skin;* purpura or petechia—*small discolored spots in the skin or mucous membrane due to extravasation of blood from the capillaries, the usual causes are some defect of the coagulating principles of the blood,*

usually the thrombocytes, excessive permeability of the capillaries, and bites of bed-bugs and other vermin; echymoses—*large purpura;* papules—*small circumscribed solid elevations of the skin;* tubercles—*larger solid elevations of the skin;* wheals—*evanescent elevations of the skin, generally more or less round and white in the center and pale red at the periphery, they are usually associated with itching;* vesicles—*minute elevations of the epidermis filled with serous fluid;* blebs—*large vesicles*; sudamina—*whitish vesicles caused by retention of sweat in the sweat ducts or upper layer of the epidermis;* pustulus—*vesicle or bleb-like elevations containing pus;* crusts—*dried exudates;* scales—*dry exfoliations from the epidermis.*

Important points to notice about eruptions are: Where they first appear, if and in what order they spread, if they are associated with fever, or other abnormal phenomena.

Change of expression of the face is often an important sign. A pinched, anxious expression is a symptom of hemorrhage and shock and it frequently develops as a patient's condition grows worse; it is also common in abnormal heart conditions. A dull apathetic expression is indicative of debility and of mental derangement; it is particularly marked in typhoid fever and its disappearance is considered a good sign. An over-alert, excited expression and a continually melancholy one usually are indicative of mental derangement.

The eyes being one of the chief factors in facial expression, the symptoms classed under that heading are equally associated with these organs and, in addition, certain other unnatural appearances may be induced by both local, distant, and systemic conditions. Some of the more common ones are: (1) Myosis or contraction of the pupils, the most frequent causes of which are opium

poisoning, uremia, paralysis of the sympathetic nerve fibers supplying the iris, pressure on certain parts of the brain, dementia, locomotor ataxia, old age. (2) Mydriasis or dilation of the pupil, seen chiefly in severe shock and collapse, atropine poisoning, glaucoma, paralysis of the third nerve, nervous excitement, hysteria, epilepsy. (3) Inequality of the size of the pupils; slight inequality sometimes occurs in health, especially in nervous individuals, but marked inequality is likely to be due either to ocular defects, pressure on certain parts of the brain, or organic brain disease. (4) Deflection of the eyes to one side is a common symptom of cerebral hemorrhage or brain tumor. (5) Redness of the conjunctiva—bloodshot—is seen in fever, eye strain, irritation, and diseases of the eye, and it is sometimes present to some extent more or less constantly when heart lesions exist. (6) Yellow discoloration of the conjunctiva is generally a symptom of jaundice. (7) Protrusion of the eyeball is a symptom of exophthalmic goiter. (8) Lacrimation is one of the earliest symptoms of measles, and it is induced by disease and irritation of the eyes and their lids and blocking of the nasal ducts which interferes with the flow of tears into the nose. (9) Puffiness of the tissues under the eyes is due to the same causes as edema in other parts of the body, but it is to be especially regarded when the patient is getting arsenic for it is one of the first symptoms of overdosing, being occasioned by increased permeability of the capillaries induced by the drug. (10) Inflammation of the eyelids may be due either to conditions affecting the lids themselves or to eye strain or disease. (11) Photophobia, or intolerance of light, is very commonly associated with disease of the eyes, brain, and cerebral meninges.

Symptoms connected with the gums, teeth, tongue,

mouth, and throat may arise both as the result of local and systemic conditions. Some of the more common ones are: A soft spongy condition of the gums associated with tenderness and a tendency to bleed easily—this is often seen in syphilis, scurvy, alveolitis, and other infections or irritations in the mouth; swelling of the gums with tenderness and salivation—a condition known as *ptyalism*—is a symptom of mercurial poisoning and of severe local infections and irritations; a blue line on the gums is seen in chronic lead, copper, and silver poisoning; small milk-white elevations which, when removed, leave an abraided surface are typical of thrush; small dark blotches with bluish-white spots in the center, that occur chiefly on the cheeks near the molar teeth (known as *Koplik's sign*) constitute one of the early symptoms of measles. Delayed dentition and badly formed teeth are a symptom of rickets and of syphilis, but these conditions may also occur if an infant has a severe attack of any disease before the eruption of the teeth; a peculiar condition of the permanent teeth in which the incisors are small, conical, and notched at the edges is typical of congenital syphilis (teeth in this condition are termed *Hutchinson's teeth*). The membrane of the tongue being continuous with that of the entire alimentary tract, its condition affords an index to that of the alimentary canal; thus, when an individual is constipated or suffering with digestive disturbances or other diseases of the stomach or intestines, the tongue is coated and furred; clearing of the tongue at the edges is one of the signs of improvement in typhoid. The tongue is apt to be red and swollen in diabetes; scarred in epilepsy; punctated like a strawberry in scarlet fever; ulcerated in mercurial poisoning, stomatitis, and syphilis. Tremor of the tongue is noted in alcoholism, paretic dementia, and in

diseases which result in great prostration, as typhoid. A symptom connected with the throat that it is of special importance to notice at once is the presence of so-called *patches* or false membrane on the tonsils or pharyngeal membrane, for this is one of the symptoms of diphtheria. Somewhat similar patches occur in follicular tonsillitis and, sometimes, in scarlet fever. The membrane consists of degenerated tissue cells, blood exudate, and pus, and it usually contains the organisms responsible for the condition. In diphtheria the false membrane is usually a dirty grayish color while in tonsillitis it is generally yellow.

Fever.—This is described in Chapter VII.

Headache is a symptom of many abnormal conditions. It may be due to (1) intracranial conditions such as meningitis, cerebral tumor, syphilitic gummata, or abcess; (2) the presence of poisons in the blood, either those resulting from defective metabolism or elimination or those of bacterial origin; (3) cerebral congestion induced by prolonged mental work or excitement, fever, exposure to the sun, a relaxed condition of the cerebral blood-vessels, conditions that interfere with the flow of blood from the brain; (4) deficiency of blood in the brain, this is common in general debility, neurasthenia, anemia, and the like; (5) reflex irritation of the cerebrum from such causes as eye-strain, nasal catarrh, ovarian and uterine disorders, gastric irritation, constipation, and other conditions that induce a constant inflow of nerve impulses to the brain. The direct cause of the headache induced by reflex irritation and poisons is often a cerebral congestion.

Abnormal conditions of hearing may arise in the course of disease and following the use of certain drugs. Deafness, partial or complete, may indicate infection

of the inner or middle ear; blocking of the auditory canal or of the Eustachian tube[1]; injury to the auditory nerve, destruction of the auditory center of the brain. The diseases in which this complication is most likely to arise are: Scarlet fever, meningitis, diphtheria, typhoid. In nervous conditions the hearing is sometimes hyperacute. Ringing in the ears (tinnitus) is a symptom of overdosing by quinine and the salicylates and it frequently occurs in anemia, general debility, arteriosclerosis, and in diseases of the ear or auditory nerve.

Hiccup (singultus) results from spasmodic contraction of the diaphragm associated with closure of the glottis, the sound is due to air being forced against the closed glottis. Hiccup may be due to direct stimulation of the phrenic nerve or the result of reflexes started by irritation in the stomach, intestines, or liver. Persistent hiccup occurring in diseases of these organs is usually a bad sign. Hiccup may also occur in extreme exhaustion and hysteria.

Pain is due to stimulation of certain sensory nerves. It differs considerably according to the nature of the stimulation. Terms commonly used to describe the nature of the sensation produced are dull, sharp, throbbing, shooting, burning, straining, collicky.

Palpitation is a rapid and tumultuous heart action that is perceptible to the patient. It may show abnormal heart conditions, anemia, excessive exercise; it may result from reflexes started by gastric or intestinal irritation, nervousness, excitement.

Excessive perspiration; known also as sweating and diaphoresis, is a common symptom of rheumatic fever and tuberculosis; in the former, the perspiration has an acid reaction and a sour odor; in tuberculosis it occurs

[1] A small canal extending between the middle ear and the throat.

periodically following an elevation of temperature. Diaphoresis is also common at the crisis of such diseases as pneumonia. If other physical conditions are favorable, diaphoresis occurring in the course of a febrile disease is generally a favorable symptom, for, under such circumstances, it usually indicates an effort on the part of the body's heat regulating mechanism to lower the temperature and shows that the conditions causing the fever are abating, but, if it is associated with a weak pulse and cold exterior of the body, it indicates excessive weakness. Diaphoresis is also induced by certain drugs and nervousness. Normally it will follow any condition that increases body temperature.

The position a patient assumes is a symptom to be noted. When abdominal pain due to inflammation exists the patient usually lies on her back with her knees flexed; if the pain is due to gas either this or the prone position is likely to be taken and the patient is apt to make pressure, or ask for pressure or heat, upon the abdomen. When dyspnea is severe, a sitting position is usually requested. In disease which involves one lung, the patient, if not sitting, will usually lie on the affected side, to give the normal lung more freedom. In diseases and poisoning which stimulate the spinal cord the head is likely to be bent backward and the back stiffened as the result of contraction of the muscles of the neck and back. In diseases of the spinal cord and meninges, the patient often lies with the thighs flexed at right angles with the pelvis and, when in this position, it is impossible to straighten the leg completely; this is known as Kernig's sign (of meningitis).

Tenesmus, ineffectual and painful straining at stool or in urination, usually indicates intense irritation in the organs involved.

Tremor or subsultus is an involuntary trembling of the body. It is characteristic of alcoholism and of excessive weakness and nervousness.

Tympanites may be defined as abdominal distention due to the collection of gas in the intestines or in the peritoneal cavity. The intestines may become distended with gas as the result of excessive putrefaction of the intestinal contents, intestinal obstruction, intestinal paralysis. Tympanites due to gas in the peritoneal cavity is a symptom of peritonitis and of intestinal perforation. Tympanites is not only a serious symptom but a serious condition for it may interfere with the functioning of both abdominal and thoracic organs. Any appearance of abdominal distention is therefore to be reported as soon as observed and is to be especially watched for after abdominal operations, in typhoid fever, and pneumonia.

Vomiting or emesis is the forcible expulsion of the stomach contents through the mouth. It is induced by stimulation of the vomiting center which is situated in the medulla oblongata and is connected by both afferent and motor nerve-fibers with the stomach and by nerve-processes with many other centers. Therefore strong stimulus, such as is provoked by conditions causing pain, or pressure upon, or irritation of, afferent nerves in any part of the body may cause vomiting. The vomiting center is also likely to be stimulated by: (1) disturbance of the cerebral circulation; (2) unusual impulses coming from the semicircular canals (*this is thought to be one cause of sea-sickness*); (3) toxic substances in the blood, such as those arising from defective metabolism and elimination and the products of intestinal putrefaction; (4) nervousness. When vomiting is induced by direct stimulation of the center by substances in the blood or impulses arising

in the brain the cause is termed a *central stimulus*, while stimulation coming to the center over afferent nerve fibers is said to be *reflex*.

Anything unusual in the manner of vomiting is to be noted; *e.g.* (1) if the vomitus is ejected with force (projectile vomiting)—this frequently occurs when the vomiting is due to a central stimulus; (2) if, contrary to the usual rule, vomiting is not associated with retching and nausea, this frequently has the same significance as, and is associated with, projectile vomiting, but it is also the nature of what is known as *esophageal vomiting* or *regurgitation of food* which is generally due to either obstruction in the esophagus, paralysis of the muscles of deglutition, or, especially in the case of infants, the ingestion of more food at a time than the stomach will hold. Also, it is to be observed if vomiting is associated with pain and, when it is, if the pain is relieved by the vomiting.

Six conditions the symptoms of which are frequently referred to without going into detail and that it is very important for nurses to notice at their onset are: acidosis, anaphylaxis, hemorrhage, shock, collapse, and inflammation.

Acidosis

Acidosis or acid intoxication is characterized by diminution of the carbonates and other fixed alkalies in the blood and other tissues. The depletion of alkalies is most commonly due to their combination with acids and their consequent neutralization. The excess acids responsible for the excessive neutralization of alkalies may be formed as the result of deficient oxidation or elimination or they may be absorbed from the intestine. Acid

compounds in the intestine are usually the result of excessive intestinal putrefaction. In infancy, some authorities believe, depletion of alkalies may result from the use of too much fat in the diet, for the excess fat combines with the calcium of the food and the compounds thus formed are excreted in the stools. Also, in severe diarrheas, there may be a loss of alkalies from the blood through the intestinal wall. Defective oxidation may arise from a number of causes, but the more common ones are: abnormal conditions of the endocrine glands, especially those of the pancreas; general systemic depression, as in shock; following prolonged anesthesia, especially chloroform anesthesia, for chloroform tends to destroy the enzymes which further oxidation; after hemorrhage or other conditions that induce severe anemia. Acidosis due to defective elimination is seen chiefly in severe nephritis.

Even when a pronounced acidosis exists the reaction of the blood does not become acid, because alkalies are absorbed from the other tissues when those of the blood are diminished and less of the ammonia carbonate synthesized from amino acids (*the chief constituents of proteins, both those of food and the body tissues*) is changed to urea. The alkalies neutralize the acids, but they also are neutralized and therefore in severe acidosis the blood does not, as normally, contain alkaline salts. This interferes with the absorption of CO_2 from the tissues, for most of the CO_2 absorbed by the blood combines with its alkaline salts and blood can hold only a relatively small amount of the uncombined gas in solution. Therefore, the CO_2 tends to accumulate in the other tissues and, when this accumulation becomes pronounced, the passage of oxygen from the blood into the tissues is interfered with. When this interference is extreme symptoms similar to

those of suffocation are induced, just as though the patient were deprived of air, and he becomes dyspnœic and, in severe cases, experiences air hunger. A typical condition of severe acidosis is seen in diabetic coma.

Symptoms of the onset of acidosis are: loss of appetite, coated tongue or the tongue may be abnormally red, often nausea and vomiting, constipation, headache, apathy, and the face may be either flushed or pale.

Anaphylaxis

By anaphylaxis[1] is meant an excessive susceptibility to some special substance, usually a protein. Certain diseases, *e. g.*, hay fever, asthma, and urticaria (hives) are thought to be of an anaphylactic nature, *i. e.*, they are supposed to be reactions to a protein (*usually a food or a plant pollen protein*) to which the individual has become sensitized. The anaphylactic reactions that nurses have most frequently to be on the watch for are those that sometimes occur following the injection of serum preparations or following the transfusion of blood (described page 538) especially when the blood is not transferred immediately after its withdrawal from the donor.

Common symptoms of mild anaphylaxis are: slight fever, itching and redness of the skin, and urticaria. **Symptoms which indicate a more serious condition are:** dyspnea, cyanosis, violent coughing, a sense of constriction about the chest, marked variation in the pulse, fever, and skin eruptions. Severe anaphylaxis (commonly referred to as *anaphylactic shock*) not infrequently ends in death.

[1] Derived from two Greek words signifying without protection.

Hemorrhage

Hemorrhage signifies excessive bleeding. **Hemorrhage may occur from** arteries, veins, or capillaries. **Certain differences are observed in hemorrhage from the different types of vessels,** viz., when the blood is from an artery (*arterial hemorrhage*) it is a very bright red and it is expelled in squirts that correspond to the contractions of the heart; blood from a vein is darker than that from an artery, because it contains less oxygen, and it flows more slowly and in a steady stream since the venous circulation is not as directly influenced by the cardiac contractions as that in the arteries; in capillary hemorrhage the blood oozes slowly from the surface of a wound or into the tissues. **Hemorrhage may be either** (1) external, *i. e.*, the blood finds an outlet to the exterior of the body; (2) internal, *i. e.*, it remains in the body cavity or tissues into which it passes from the injured vessels; (3) subcutaneous, *i. e.*, directly under the skin, the discoloration seen in bruises is due to the blood from capillaries in the subcutaneous tissue. Hemorrhage occurring at the time, or within twenty-four hours, of an accident or operation is called *primary hemorrhage* while one occurring later is known as a *secondary hemorrhage.*

The more common causes of hemorrhage are: (1) traumatism, either operative or accidental: (2) degeneration of the tissues of the blood-vessel walls such as occurs in the course of certain pathological processes, *e. g.*, ulceration, suppuration, and malignant growths; (3) abnormal conditions of the blood-vessels such as aneurysm; (4) severe congestion due to interference with the venous circulation (*e. g.*, profuse hemorrhage may occur from the stomach and intestines as the result of

conditions such as cirrhosis of the liver, that interfere with the portal circulation—*it will be recalled that most of the gastric and intestinal veins open into the portal vein and that the contents of the latter pass into hepatic veins*); (5) abnormal conditions of the blood such as those existing in hemorrhagica purpura (*described with blood diseases*); (6) childbirth, abortion, etc.

Also there are **various conditions that favor hemorrhage following operations and accidents,** *e. g.*, hemophilia (*described with blood diseases*), jaundice, diabetes, general debility from any cause, one reason why debility favors hemorrhage is that, under such circumstance, the blood pressure is likely to be so low during the operation that there is little bleeding from some vessels that should be ligated and thus they may escape the surgeon's notice and later, especially if the patient is restless, profuse bleeding may occur from them; severe contusion, necrosis, or suppuration of the tissues, when such conditions exist, secondary hemorrhage may be due to sloughing of the vessels around the ligature; restlessness after operation.

A slow more or less continuous bleeding that is not profuse enough to be called hemorrhage, but that, in the course of time, produces an anemic state similar to that following hemorrhage, is characteristic of conditions, such as scurvy, that increase the permeability of the blood-vessels, of purpura, and infestion with hook-worm.

Symptoms.—The escape of blood seen in external hemorrhage is referred to as the **local symptom of hemorrhage. The constitutional symptoms are due to** the consequences of the loss of blood from the body, the more important of these are (1) interference with the heart's action; (2) reduction of the tissues' supply of oxygen, fuel, and water. **The severity of the symptoms**

depends upon (1) the amount of blood lost; (2) the rate at which it is lost, a much larger amount of blood can be lost without fatal results if the loss takes place slowly because, under such circumstance, the heart often has time to adjust itself to the reduced blood pressure and more time is allowed for the absorption of liquid from the tissues (which helps to lessen the reduction of blood pressure) and for the formation of new red cells which usually takes place very quickly following hemorrhage, also slow bleeding allows more time for the arrest of hemorrhage by the mechanical means used to check it, these and nature's provisions for checking bleeding are described under emergencies. (3) The patient's condition at the time of hemorrhage, naturally a healthy robust individual is likely to be able to withstand the effects of hemorrhage better than an anemic, debilitated individual.

The constitutional symptoms usually associated with slight hemorrhage are: pallor, rapid pulse, sensations of faintness, vertigo, and nausea, and sometimes sweating. If the loss of blood becomes pronounced the severity of these symptoms increases and there will be great thirst, air hunger, and restlessness; the pulse becomes exceedingly rapid, irregular, and weak; the breathing shallow and quick, or sighing; and the temperature falls.

Shock and Collapse

Shock implies a state of depression of the central nervous system and of the vital body functions; the heart's action is weakened, the tone of the blood-vessels is below par, the blood tends to accumulate in the visceral arterioles, and, it is thought, there is increased exudation of fluid from these vessels, consequently most of the tis-

sues do not get sufficient fuel, oxygen, and nutrient. The brain and heart are the parts that suffer most severely from this insufficiency and the poor pulmonary circulation is injurious to the body as a whole since it interferes with the aëration of the blood.

The actual cause of shock is unknown, but it is believed that **important factors in producing it are:** loss of blood; fear; pain; injury to nerves, even when not associated with pain, as when the individual is under the influence of an anesthetic; substances formed by the disintegration of injured tissue; direct depression of the central nervous system as by the anesthetic used for an operation.

Examples of the theories that have been advanced as to the way in which these causes of shock act are: (1) by over-stimulating nerve centers, the over-stimulation inducing fatigue and consequent depression of the centers, especially the vasomotor centers; (2) by over-stimulating the suprarenal capsules, the over-stimulation being followed by exhaustion of these glands; during the period of stimulation there is an increased output of adrenaline into the blood, but this is followed, it is thought, by cessation of secretion (*it will be recalled that* (*a*) *under ordinary conditions a minute amount of adrenaline is secreted by these glands and absorbed by the blood and this helps to maintain the tone of the blood-vessels;* (*b*) *these glands are stimulated by fear, anger, excitement, pain, and the increased adrenaline then secreted stimulates the sympathetic system and thereby increases the contraction of the visceral blood-vessels in consequence of which more blood is forced to the muscles and skin, lack of secretion, on the contrary, may, it is thought, favor relaxation of the blood-vessels*); (3) interference with oxidation as the result of the acidosis induced by the acid products of tissue disintegration (see under Acidosis); (4) some authorities think

that the products of tissue disintegration may have a direct relaxing effect upon the blood-vessels.

Summary of factors that are thought to be of importance in producing post-operative shock:

1. Pre-wound factors of fatigue, exposure, lack of fluids and presence of excitement.

2. Capillary stasis and increased permeability of vessels.

3. The effects of hemorrhage, including the reduction of blood volume.

4. Absorption of toxic products from infected or damaged tissues, or from both combined.

5. Possibly, also, a toxemia from hypersecretion of adrenaline.

6. Post-wound factors of pain, hemorrhage, cold, etc.

7. Diminution of intracellular oxygenation, leading to irrecoverable damage of finer nerve cells.

8. Presence of acidosis in the blood (reduction of alkali reserve).

9. Profound lowering of body temperature.

10. Toxic action of certain anesthetics.[1]

Collapse.—As far as known the condition existing in collapse is similar to that of shock, but the term collapse is used when it occurs in the course of illness and as the result of poisoning, and the term shock when it is due to trauma, either operative or accidental.

The symptoms of shock and collapse vary with the intensity of the prostration and there may be said to be three distinct degrees, viz.; (1) Mild or transitory in which the chief symptoms are: dizziness, nausea, faintness and

[1] *Progressive Medicine*, Vol. II, 1921.

sometimes fainting. (2) A moderate degree, in which there is likely to be nausea and perhaps vomiting and sometimes diarrhea, muscular weakness, profuse sweating, clammy skin, faintness and a sensation of general prostration. (3) Severe, the onset may be gradual or sudden, it may or may not be accompanied by unconsciousness, in shock resulting from an accident the individual may, for a time, show evidence of excitement, but the face soon assumes an anxious expression or, if the individual is unconscious, it may be expressionless and mask-like; the skin becomes cold and clammy, sweating profuse, the color may be either cyanotic or pale; the breathing becomes shallow and labored or sometimes Cheyne-Stokes; the pulse rapid and feeble; the temperature usually falls. It will be noticed that the symptoms of these conditions are similar to those of hemorrhage for, due to the inefficient circulation in shock and collapse, the tissues may be as much deprived of blood as they are when blood is lost from the body and, as in hemorrhage, many of the symptoms are due to this loss. Distinguishing features that may sometimes be observed are (1) restlessness is common in hemorrhage and rare in shock; (2) the color is more commonly cyanotic in shock and pale in hemorrhage.

Inflammation

The symptoms of inflammation are: pain, heat, redness, and swelling of the affected area, and imperfect functioning. **The causes of the symptoms** are mentioned in Chapter XX. **An important condition to notice** if present in an inflamed area is an abrupt termination of the red coloration (instead of a gradual fading) so that there is a pronounced color demarcation between the edges of the inflamed area and the surrounding skin.

This symptom is typical of erysipelas, an infection that is readily transmitted to all kinds of wounds.

Conditions to Observe in Discharges and Excreta

Expectoration. Sputum

By **expectoration** is meant the act of coughing up and spitting out discharges from the lungs and lower air passages. **Sputum** proper consists of saliva and mucus which, due to irritation or other abnormal stimulus, are secreted in larger amounts than usual. Sputum may however be mixed with blood or pus and the mucus instead of being a thin, almost watery fluid, may become thick and very tenacious so that it will be expectorated with difficulty. As changes in the nature of sputum are due to the conditions causing them, the sputum is of great diagnostic value in diseases of the respiratory organs and it must be always carefully observed. The more common types of sputum are as follows: **Mucoid sputum** (*i. e.*, mucus-like) is commonly associated with irritation such as is present with a cold, in asthma, the early stages of bronchitis, pneumonia, and tuberculosis. **Muco-purulent sputum** contains pus, as well as mucus, and it is thicker and more tenacious than the mucoid type. It is present in the later stages of bronchitis; in bronchiectasis; in pneumonia, after the crisis; in the later stages of tuberculosis; and in abscess of the lung or some part of the pharynx or communicating sinuses. **Purulent sputum,** which consists of almost pure pus, usually indicates the rupture of an abscess in some part of the respiratory system. **Blood in the sputum** occurs chiefly in the later stages of pneumonia, hemorrhagic infarction of the lungs, tuberculosis, cancer, and gangrene of the lung. In pneumonia the amount of blood in the sputum generally

increases with the severity of the inflammatory process. If pulmonary vessels are ruptured the material coughed up may be solely blood mixed with air, which gives it a frothy appearance.[1] This occurs most frequently in tuberculosis, and as the result of puncture of a lung, as by a fractured rib. In cancer of the lungs the sputum sometimes resembles lumps of red-currant jelly. **Rusty sputum** is the name given to the blood-streaked sputum that occurs in pneumonia. **Prune-juice sputum** is sputum containing blood that has been so altered by disintegration during retention in the lung that it resembles prune juice. It occurs in severe cases of pneumonia, in cancer and in gangrene. **Nummular sputum** is the term applied to round coin-shaped masses of sputum which sink in water; it is seen chiefly in advanced tuberculosis. **Watery, frothy sputum** is common in edema of the lungs. **Fetid sputum** is so-called from its offensive odor; purulent and prune-juice sputums are particularly likely to have this characteristic. The sputum of individuals who work in coal mines and in factories in which dust-producing industries are carried on is likely to be of a grayish color or almost black and the dust may cause sufficient irritation and congestion to induce sputum without the presence of other abnormal condition. These conditions are also likely to exist in *mouth-breathers* because air, entering through the mouth, is not filtered, as it is when it passes through the nasal passages.

Vomitus

The more common conditions of vomitus other than that consisting mainly of undigested food are: **Bilious**

[1] Because of this, blood from the lungs (hemoptysis) can always be distinguished from that from other parts of the respiratory tract and the stomach.

or green vomiting; this is likely to be seen whenever vomiting persists after the stomach has been emptied of food. The color is due to bile which is forced from the intestines into the stomach. **Dark brownish-green vomitus** with an intensely acid reaction is noted in peritonitis. **Blood in the vomitus** may be the result of abrasion of the mouth, pharynx, or esophagus; and vomited blood, *i. e.*, that ejected from the stomach, may have been swallowed, otherwise it is generally due either to traumatism, gastric ulcer, carcinoma, severe gastritis, abrasion of the stomach by corrosive poisons, congestion such as is caused by interference with the portal circulation, hemorrhagic purpura, severe infections or poisons that cause changes in the permeability of the blood-vessel walls or the composition of the blood, or to vicarious menstruation. Blood may be vomited in such quantities that the conditions of hemorrhage will ensue (this is known as *hematemesis*) or it may be in such small amounts that its presence will be detected only with the help of a microscope or spectroscope or by chemical tests; this is known as *occult* (hidden) *blood*. If blood remains in the stomach after it is shed it is likely to be digested and assume the condition described as coffee-grounds, and is known as **"coffee-ground vomitus." Fecal or stercoraceous vomitus** is usually due to either intestinal obstruction or a gastro-intestinal fistula. **Watery or mucus vomit** is seen in chronic gastritis, in nervous dyspepsia, and after persistent vomiting. **Purulent vomitus,** *i. e.*, that containing pus, generally indicates either the rupture of an abscess or severe gastritis. **Profuse vomiting of fermented frothing matter** is indicative of gastric dilation which prevents the stomach being emptied in a normal manner and furthers the excessive accumulation of food.

Feces

The character of feces being an index of the condition and functioning capacity of the digestive organs, all evacuations of the sick and of infants should be carefully examined. This should be done in a good light and, when there is any special reason for examination, the feces should be broken or stirred with a spatula for it is often difficult to detect foreign matter.

The principal items in connection with stools to be observed are: The number of movements in the twenty-four hours, the consistency of the stools, their shape, color and odor, the presence of any foreign matter.

The appearance of normal stools varies somewhat according to the diet, but the stools of an adult on an ordinary mixed diet usually consist of a light to dark brown, soft mass of cylindrical shape or, if food with little residue is eaten, partly formless. The normal stools of a breast-fed infant are soft, with homogeneous consistency, they have a yellow or orange tint and an acid reaction. Those of an infant fed with cow's milk are lighter in color and bulkier. The normal cvacuation of the new-born infant is an odorless, sticky, thick, brown liquid known as *meconium*.

The usual number of stools for adults are one or two a day, for babies fed with human milk, three to six a day, babies fed artificially, usually, have fewer, but larger evacuations. **Change in the frequency of defecation** is usually due to either irritation or constipation. In the former condition the change is an increase; in the latter, it is generally a decrease, but, occasionally, especially when the condition is due to lack of intestinal tone, it may be an increase, because of inability of the rectum to empty itself properly; in such case the consistency of

the stool will usually indicate constipation. Intestinal irritation may be due to medication, undigested food, or diseased conditions of the intestine. Constipation is most commonly due to a diet deficient in food with undigestible elements, or to a lack of tone in the intestinal and abdominal muscles, or to impairment of the sensitiveness of the rectum so that it is not effectually stimulated by its contents,[1] or to an over-contracted sphincter or obstructive lesions caused by intestinal disease.

Change in the consistency of stools is generally due to the same conditions that cause change in their number, because water is absorbed readily from the large intestine and, therefore, the longer material remains there the harder it will become, thus the constipated stool is generally a hard one. On the contrary, if matter is hurried through the intestine the stool will be soft or, when the irritation is so severe that the rate is greatly accelerated, watery. Saline cathartics and certain diseases, as cholera and severe diarrheas, still further increase the fluidity of stools by promoting the transudation of water from the body, and salines, in addition, by preventing the absorption of the water in which they were dissolved previous to ingestion.

Change in the shape of stools other than that due to consistency, usually results from pressure upon, or stricture in, the intestine. Such conditions may cause the stools to be of unusually small diameter or flat.

The more common changes that occur in the color of stools are: Black stools; this color may be due to the use of such drugs as bismuth, charcoal, iron, or tannin, or to the presence of blood that has been retained in the intestine for some time and while there altered by the digestive juices. Red discoloration of the feces, unless

[1] This results from frequent failure to respond to such stimulus.

the patient is getting hematoxylon (logwood), usually indicates the presence of freshly shed blood. Green stools may result from the presence of bile in unusually large proportion, or excessive intestinal putrefaction, or intestinal disease. Greenish-yellow stools of a thick liquid consistency are characteristic of typhoid. Gray stools indicate a lack of bile in the intestine; they are often seen when the patient is jaundiced for, in such case, the bile is being absorbed by the blood instead of being discharged into the intestine.

A foamy, bubbling appearance of infants' stools usually indicates too much sugar in the diet.

The more common causes for change of odor of feces are: Lack of bile, excessive intestinal putrefaction, diseased conditions of the intestine.

The foreign substances most commonly found in stools are: Blood, mucus, pus, undigested food, gallstones, worms. What Causes Blood to [illegible]

Blood in the stools may be the result of: inflammation, as in enteritis; acute congestion resulting from continued purging, or interference with the venous circulation, as in chronic heart disease; ulceration of the intestinal wall, as in typhoid; or corrosion by poisons; cancer; conditions which affect the composition of the blood or state of the capillary walls, as scurvy and purpura; traumatism; piles or fistula, or it may be from the stomach or other part of the alimentary canal. When the patient is a woman it may be necessary to ascertain if the blood is from the genital or urinary tract. The color of the blood and its location in the feces may indicate its source, for blood that comes from the upper part of the alimentary tract, unless it is passed at once, will be dark, even tarry-like, and it will be mixed with the feces, but blood coming from the lower part of the bowel will be bright red and the

nearer its source is to the rectum the less will it be mixed with the feces; that due to piles and rectal fistula is usually all on the surface and the stool is otherwise normal and free from excess mucus. Blood may be in the feces in such minute amounts that it is designated *occult blood;* or in such large quantities that it is a hemorrhage. Hemorrhage from the intestines is termed *enterorrhagia.*

Mucus is present in feces in minute amounts under normal conditions because it is secreted by mucous cells to lubricate the membrane and much of the secretion becomes mixed with the feces. When, however, the intestinal mucosa is excessively irritated its cells become over-active and unusual amounts of mucus are secreted. Thus, any condition causing unusual intestinal irritation is likely to be associated with excess mucus in the stools in amounts that will be parallel with the degree of irritation. When the irritation is in the small intestine or upper part of the large intestine, the mucus is mixed with the stools; when it is in the lower part of the bowel it is chiefly or entirely on the surface.

Pus in the feces may be due to severe intestinal inflammation or to the rupture of an abscess in, or into, the intestines. Unless pus is present in large amounts chemical tests or microscopical examination may be necessary to detect it.

Stools which contain much undigested food are known as *lienteric stools;* they are noted in conditions of the stomach, intestine and pancreas which interfere with digestion. Food substances that are more or less undigested may also be seen in feces if too large a quantity of any one particular food, or of food as a whole, is eaten. Imperfectly digested fat will also be seen in defecations when there is a lack of bile in the intestine, and in disease

of the pancreas; its presence may be indicated by a loose, greasy, sour-smelling movement or it may be seen as small yellow masses or flakes. Similar but harder masses, that are white inside, will be seen in an infant's stool when it is given too much protein. An easy way to distinguish between masses of fat and protein is to put the material into a little ether—fat will be dissolved, protein will not be.

Gall-stones are formed chiefly in the gall bladder, but also in the biliary ducts. Their usual cause is a catarrhal inflammation (started most frequently by typhoid or colon bacilli) which leads to the precipitation of solid matter of the bile, especially bilirubin-calcium. The passage of a large stone is associated with intense pain, but this is not necessarily the case with small ones and, as a rule, it is small ones that have to be watched for when cholelithiasis is suspected, but has not been diagnosed. Stones vary greatly in size and shape, but are usually either white or of a brownish shade. A method of examining defecations for calculi is described in Chapter X.

The worms most frequently found in feces are: The thread- or seat-worm, a fine white worm one-fifth to two-thirds of an inch in length; the round or eel-worm, which is of a grayish or pinkish color and in form resembles earthworms; the hookworm which measures from 8 to 18 mm. in length; the tapeworm, the type common in this country is the *tænia saginata* with which man becomes infected by eating beef containing the larvæ of the worms, the mature worm is from five to ten yards in length, it is usually flat and the body consists of many segments or links, some of which may, from time to time, become detached and be expelled in the feces; these may be mistaken for shreds of thickened mucus.

When a tape-worm is expelled it must be kept for the physician's inspection or sent to the laboratory, for it is most important to ascertain if the head is present, since, if it is not expelled, the worm can grow again. The head is very minute (about the size of the head of a pin) it is cuboid in shape and slightly darker in color than the body.

Urine

Normal human urine is a clear yellow liquid, of weakly acid reaction, with an average specific gravity of 1020, the usual limits in health being 1015 to 1025.

The average quantity voided per day by a healthy adult is between forty and fifty ounces; by a child between nine and fourteen years, thirty-five to forty ounces; between five to nine years, twenty-five to thirty-five ounces; two to five years, fifteen to twenty-five ounces.

Urine consists chiefly of water, holding in solution nitrogenous substances—principally urea, ammonia compounds, salts of uric acid (urates), creatinin, and similar substances—inorganic salts, pigments which give it color, etherol substances to which its odor is due.

These substances are derived from the blood and represent (1) material that has been formed by the catabolism of substances of the body cells; (2) matter absorbed from the intestine and not used for tissue building; this may or may not have undergone change after absorption, for some substances, e. g., meat extractives, cannot be used by the body either for tissue building or fuel. Also there may be, even in health, other substances present derived from unusual articles of food or drugs.

The proportion of the normal urine constituents will vary somewhat in health according to the quantity and kind of food eaten, the amount of exercise taken, and other factors that influence metabolism. But any considerable variation in either the quantity or nature of the urine constituents that cannot be accounted for in these ways usually means either disturbed metabolism, disease of the liver or kidneys, or abnormal conditions in the intestine.

Changes in the constituents of the urine that may indicate disturbed metabolism or disease of the liver are:

Either increase or decrease in the amount of urea. A diminished output of urea with an increase in the amount of ammonia compounds is common in diseases of the liver and in the condition known as acidosis. (*It should be recalled that ammonia salts are derived from the amino acids of which proteins are composed and urea from the ammonia compounds, and that the change takes place chiefly in the liver. It is believed that when the amount of free alkalies in the blood is diminished—which condition when pronounced is known as acidosis—the alkaline ammonia compounds are absorbed by the blood more readily than usual and thus a smaller quantity is changed to urea.*)

Glucose, in small amounts, may be present in the urine after the ingestion of large amounts of glucose, following nervous upsets, and the use of certain drugs, but its persistence is indicative of defective metabolism of glucose such as occurs in diabetes mellitus.

The presence of acetone and diacetic and similar acids in the urine indicates defective metabolism of fats, this is very commonly associated with defective metabolism of carbohydrates, the normal oxidation of the latter being essential for that of fats.

A substance contained in the urine in the course of some infectious diseases.—In some of the infectious diseases a chromogen,[1] the nature of which has not as yet been determined, is commonly present in the urine. The presence of this substance is ascertained by (1) the development of a deep red coloration of the urine upon the addition of what is known as diazo solution and ammonia, this is known as **Ehrlich's diazo reaction**; or (2) in what is known as *Russo's test*, a green color upon the addition of methylene blue. A positive diazo reaction is almost always obtained in the early stages of typhoid fever and it reappears if a relapse occurs. It is also sometimes present in measles, pneumonia, miliary tuberculosis, scarlet fever, diphtheria, and erysipelas. A positive Russo reaction is usually obtained as early as the second day in typhoid fever, and it persists throughout the disease, and its intensity is in proportion to the severity of the disease. This reaction is also obtained in measles, smallpox, and chronic tuberculosis.

Substances in the urine that usually indicate abnormal conditions of urinary organs are:

1. *Albumin.* This, however, is sometimes present in the urine without disease of the kidneys, as the result of conditions that affect the blood pressure in the renal vessels and in nervous and febrile diseases and those which cause extensive change in the condition of the blood, but persistent albuminuria usually indicates either actual nephritis or a severe congestion of the kidneys, such as that occurring in certain diseases of the heart and liver.

A decrease in the amount of urea and other protein cleavage products and of salts in the urine often accompanies persistent albuminuria as the abnormal conditions

[1] Any substance which gives origin to a colored matter.

that allow the transudation of albumin (*a normal constituent of the blood*) also tend to lessen the power of the kidney cells to remove waste products from the blood.

2. *Mucus* may be in the urine as the result of irritation of any part of the urinary tract.

3. *Pus* in the urine (*pyuria*) indicates suppurative inflammation in some part of the urinary tract or the rupture of an abscess into the tract.

4. *Blood* in the urine (*hematuria*) is generally the result of traumatism, corrosion, or severe inflammation in some part of the urinary tract; or of calculi; or of conditions which affect the coagulable property of the blood or the permeability of the blood-vessels.

5. *Renal calculi* are concretions that have formed in the kidney by the deposition of crystalline material from the urine around a definite nucleus. The latter usually consists of organic matter, such as blood, pus, mucus, desquamated epithelial cells. Such concretions vary in size from the consistency of a coarse sand (usually termed gravel) to the size of a large bean. Several stones may be present at a time. This is further described in Section 3 under Diseases of the Kidneys.

6. *Casts* consist of coagulated material that has hardened in the urinary tubules. They are so-called because, when washed from the tubules by the urine, they retain the shape, and are thus a cast, of the tubules. The origin of the material deposited is not always known, but it is thought to be derived either from degeneration of renal cells, or a secretion of diseased cells, or a transudate from the blood. Casts vary in appearance, some being transparent and homogeneous in consistency; such are known as *hyaline casts;* others are full of granules and are termed *granular casts.* others contain fat, others blood, others

pus, others epithelial cells and they are named according to their content. A few hyaline casts will frequently be found in normal urine, a rise of blood pressure from even normal causes being sufficient to produce them, but all of the other types indicate abnormal kidney conditions. All casts are of microscopic size.

7. *Epithelial cells* from the walls of the genito-urinary tract, if more than a very few are present, denote inflammatory or destructive lesion in some part of the tract.

Indican is the principal foreign substance found in the urine as the result of **defective intestinal conditions:** It is produced by the disintegration of protein substances by putrefactive bacteria. It may be present in the urine in very small amounts under normal conditions, but more than a trace is usually due to excessive intestinal putrefaction or else to conditions associated with the decomposition of pus or disintegrated tissue.

Bile will appear in the urine if its elimination is interfered with, for it is then absorbed by the blood. Common causes of obstruction are: The presence of foreign substances (*e. g.*, gallstones) in the gall bladder or biliary ducts; pressure on the ducts by tumors; stricture of the ducts; inflammatory conditions of the duodenum which occlude the common bile duct; catarrhal inflammation of the minute bile ducts excited by toxic substances circulating in the blood or blocking of these ducts with the debris of erythrocytes. *It will be recalled that the worn-out erythrocytes (red corpuscles) are disintegrated chiefly in the liver.* The presence of bile in the urine in more than minute amounts is usually associated with jaundice.

With the exception of gravel and calculi, the presence of the substances mentioned in the preceding pages can only be accurately determined by chemical or microscopical examination, and nurses, except in special cases, are

not expected to discover them, but they are expected to notice anything unusual in the appearance of the urine and, when it exists, to report the fact and save a specimen.

The conditions of the urine that nurses are especially to observe are: the quantity, color, transparency, and odor.

Terms commonly used for variations in the quantity of urine passed and the reasons for such variations are (1) **Polyuria,** which means an increased flow of urine, the most common causes are: excessive intake of fluids, the use of diuretics, diminution of perspiration, neurotic conditions, diabetes mellitus, diabetes insipidus, some types of nephritis. (2) **Oliguria** or diminution of secretion, this most commonly occurs when the intake of fluids is limited; when the loss of water through other channels is increased as by diarrhea, profuse perspiration, or continued vomiting; in fever; in conditions which interfere with the renal circulation, *e. g.*, some chronic cardiac diseases and abnormal conditions of the kidneys. (3) **Anuria,** which means without urine. When the failure to pass urine is due to lack of secretion of the kidneys the condition is termed (4) **suppression of urine,** when urine is secreted, but not voided, the condition is termed (5) **retention of urine.** Suppression occurs chiefly in severe nephritis, shock, and collapse. Retention is most commonly due to such causes as nervousness, obstruction in, or paralysis of, the bladder or urethra, and depression of the nervous system. (6) **Retention with overflow,** this condition is characterized by over-distention of the bladder with urine and either a more or less constant leakage from the bladder or the frequent voiding of small amounts of urine, but the bladder fails to contract and expel its contents. If the condition is not relieved the

bladder may become greatly distended and it will then extend into the abdominal cavity and its outline may usually be distinctly felt; if the area over the bladder is percussed a dull sound will be emitted and, if the patient is conscious, there will be pain.

Change in the color of urine will be observed with variations in quantity for, naturally, a urine is darker when it is concentrated than when it is dilute. An exception to this seen in diabetes mellitus, when, though there is an abnormably large amount of urine passed, the color is deeper than normal because of the presence of sugar which makes the urine more concentrated than usual, and thus not only heightens the color, but causes a higher specific gravity. Other causes of change of color are: the presence of such foreign substances as blood, which causes either a red or a smoky hue; bile, which imparts a brownish shade; mucus, pus, and chyle[1] which cause a whitish cast; excessive amount of urates will give a red discoloration, and large doses of certain drugs, especially carbolic acid, and its allies, senna, rhubarb, logwood, and methylene blue, give characteristic colors.

The transparency of urine is lessened by conditions which affect its color.

The odor of normal urine becomes ammoniacal if it is allowed to stand long after being voided, owing to chemical changes in its proteins, but if this odor is present when urine is passed it shows that such changes have taken place in the bladder and this usually indicates cystitis. Certain drugs, especially sandal-wood, turpentine, cubebs, and copaiba and also asparagus impart characteristic odors.

[1] Chyle is seen in the urine (chyluria) in the condition known as *filariasis*, an infection due to a parasite called the *filaria bancrofti* which causes obstruction in lymph glands.

Examination of the Blood

Some of the more common reasons for the examination of the blood are to ascertain: (1) if bacteria or their products are present. (2) The number and condition of the erythrocytes (red corpuscles). (3) The amount of hemoglobin. (4) The number of white corpuscles and the relative percentage of the different types. (5) The coagulation time of the blood, *i. e.*, the time that elapses between the appearance in the wound of the drop of blood that is taken to be tested and the first evidence of fibrin formation in the blood in the laboratory instrument. This test is made chiefly when the patient is suspected of having a hemorrhagic diathesis (*e. g.*, *hemophilia or purpura, described in the section on Diseases of the Blood*) or to ascertain if an operation can be performed without too great danger of hemorrhage when jaundice or other condition exists that tends to retard the coagulation of blood. *The normal coagulation time is generally stated as being from 2 to 8 minutes, but it varies considerably and is influenced by such things as diet, medicine, and the time of day, e. g., even in perfectly healthy subjects a sample of blood taken in the early morning sometimes takes 12 to 17 minutes to clot, a slowness which at other times would indicate a distinctly pathological condition. The most rapid coagulation occurs about 4 o'clock in the afternoon.* (6) Bleeding time, *i. e.*, the time that bleeding will continue after, for example, a prick made in the ear. This test is made for the same reasons as the coagulation time. Occasionally, even when the coagulation time is normal, the bleeding time is prolonged and this, like slowness of coagulation, favors hemorrhage. (7) The number of blood platelets or thrombocytes. (8) The proportion of certain of the chemical constituents of the blood *e. g.*, (a) glucose, uric acid, creatinin, in this

way disturbance of metabolism and renal function can be ascertained, or (b) if bile constituents are present, which indicates defective elimination of bile.

Methods of discovering bacteria.—The methods most commonly used to determine the presence of bacteria are microscopic examination and certain tests to ascertain if there are specific antibodies present, as is usually the case if the individual has the infection for which the test is made, the antibodies being the result of the body's reaction to the germ causing the infection. Two of the best known tests of this nature are (1) the Widal test for typhoid in which serum obtained from the patient's blood is added to a culture of the bacillus typhosus (*the causative organism of typhoid*). If the patient has typhoid, by about the end of the first week of the disease, his blood will usually contain sufficient specific antibodies, known as agglutinins, to cause the clumping or agglutination of the bacteria used for the test. In the laboratory reports of the findings of this test the terms negative, doubtful, and positive are used. Negative signifying that there was no result, and positive that agglutination occurred. A negative result does not always show that the patient has not typhoid for, in some individuals, the formation of the specific agglutinins takes longer than others. (2) The Wassermann test for syphilis. Symbols commonly used by technicians in reporting the results of the Wassermann test and their significance are:

++++ which means very strongly positive
+++ which means strongly positive
++ which means positive
+ which means weakly positive
± which means doubtful
− which means negative.

In this country a positive reaction is taken to mean that the patient has syphilis because the only other diseases that give a positive reaction to the Wassermann test (*e. g.*, leprosy, sleeping sickness, pellagra, and yaws) are not prevalent here. A single negative result, however, is not a sure indication that the patient has not syphilis since the causative germs are not always present in the blood in sufficient numbers to give the specific reaction.

Significance of changes in the number of erythrocytes and the amount of hemoglobin.—(*The students should read the Chapter describing the red and white corpuscles, hemoglobin, and blood platelets in their textbooks of Anatomy and Physiology.*) Deficiency of erythrocytes—*i. e., red corpuscles*—and hemoglobin in the blood is indicative of anemia. In severe anemias, especially pernicious anemia (see Section 3), nucleated red cells are sometimes found in the blood. This is supposed to indicate a temporary increase in the activity of the bone-marrow (*where the red cells arise*) in response to stimulus induced by the body's need of oxygen.

Normally, when the number of red cells is 5,000,000 per cmm., which is the average number in men between 30 and 50 years of age,[1] there is, on an average, 13 to 14 grams of hemoglobin to each 100 c.c. of blood and 14 grams per 100 c.c. is commonly referred to as 100 per cent.

[1] From birth until about the tenth year the number of red cells is relatively high, it then gradually falls. It rises again about the time of puberty and in young healthy males may range from 5,500,000 to 6,000,000 until about 30 years of age, there is not, however, such a marked increase in the female. After 50 years of age, in males the number generally becomes less than between the ages of 30 and 50, while in women, after the menopause, the count becomes higher than during the period in which menstruation occurs.

The relative proportion of red cells and hemoglobin is referred to as the color index (*the amount of hemoglobin in the blood is commonly estimated by comparing the blood taken for examination with a standard scale of colors that has been prepared in accordance with the findings of the color of blood when estimated by quantitative chemical tests*). **By color index is meant** the percentage of hemoglobin divided by the percentage of erythrocytes, 5,000,000 being considered 100 per cent. Naturally, therefore, the normal color index in the male between 30 and 50 years is 1. In secondary anemias the color index is almost always less than 1, quite commonly it is as low as 0.3, which shows a loss of hemoglobin out of proportion to that of the erythrocytes. In pernicious anemia, on the contrary, the color index is high, though there is less hemoglobin in the blood than normal; *e. g.*, the red count may be 1,250,000 (one-quarter per cent.) and the hemoglobin only 35 per cent., but the red cells are then reduced to one-fourth their normal number and the hemoglobin only somewhat less than one-third, thus the color index is about 1.10.

Changes in the number of white cells.—The ordinary average number of the different types of white cells in the blood is about as follows:

Leucocytes:	*Number per cmm.*	*Percentage*
Small mononuclears	1200–2000	20–25
Large mononuclears	200– 400	3– 5
Polymorphonuclear neutrophiles	5000–5500	65–75
" eosinophiles	100– 200	2– 4
" basophiles	0– 50	0–½
Lymphocytes	1200–1500	20–24

Increase in the number of leucocytes above about 10,000 per cmm. is known as *leucocytosis;* decrease below

about 5,000 as *leucopenia;* increase in the number of lymphocytes as *lymphocytosis.*

Leucocytosis may be due to either physiological or pathological conditions. **Examples of physiological leucocytosis are:** increase in the number of leucocytes in the blood during digestion, in pregnancy, and in the newborn. **Allied to physiological leucocytosis** is that which occurs as the result of cold baths, massage and certain other therapeutic measures. In some of these cases the leucocytosis is not due to the development of an extra number of cells, but to their passage into the blood from the lymph-nodes, spleen, etc., where there are always large numbers collected. **Pathological leucocytosis** is associated with the presence of malignant tumors (*cachetic leucocytosis*), following hemorrhage, most pyogenic infections, and a number of febrile diseases. Pyogenic infections are usually accompanied by an absolute increase of the polymorphonuclear neutrophiles which runs roughly parallel to the temperature and which depends for its existence and grade on the activity of the inflammatory process.

Whatever its immediate cause **pathological leucocytosis represents** a reaction of the individual to the disease. In those conditions which usually call forth leucocytosis a high white count means a vigorous reaction, while a low count may mean a poor reaction.

When the number of white cells as a whole is counted it is called an **absolute count,** when the different kinds of white cells are counted it is called a **differential count.** A differential count is considered of importance in certain infections both to ascertain the degree of the patient's resistance and, in some cases, the nature of the infection; for example, in pyogenic infections.

If the absolute count is:	*The percentage of polynuclears:*	*The indications are:*
35,000	95	The infection is severe, but power of resistance is good.
30,000	80	Fairly severe infection, but resistance very good.
7,000	95	Severe infection, condition grave.
7,000	65	No infection.

Increase in the number of eosinophiles (*termed eosinophilia*) occurs chiefly in disease of the bone marrow; some skin diseases; asthma; during infection by certain animal parasites as tapeworms, trichina, amœba; in some diseases of the genital organs.

Increase in the lymphocytes is observed chiefly in poorly nourished children, status lymphaticus, lymphatic leukemia, whooping cough, and adenitis.

Leucopenia, or decrease in the number of white cells, is typical in typhoid fever, influenza, acute miliary tuberculosis, measles, malnutrition, chronic intoxication by certain drugs as alcohol, arsenic, mercury, morphine, and ether.

Means of obtaining blood for examination.—For most of the routine blood examinations only a few drops of blood are required and these are usually obtained by pricking the lobe of the ear. This part is chosen because it is relatively sensitiveless and the patient can be prevented seeing the blood. When a larger amount of blood is required it is usually aspirated, by means of a Lüer or other syringe from the median basilic vein in the bend of the elbow. This operation, which is known as venous puncture is described in Chapter XVIII.

The blood is always secured by a doctor or technician. For a venous puncture the nurse may be required to assist

as described in Chapter XVIII., but as a rule a nurse's assistance is not required for the other methods further than, if the operator is not likely to do it, to explain to the patient something of the nature of the procedure and assure her that it will not hurt, etc. Usually the technician brings the various appliances required all ready prepared from the laboratory.

Vital Function Tests

A vital function test, as the name implies, is a test used to determine if the functional capacity of a vital organ is normal or defective. The purposes of some of the more commonly used ones and the procedure in the portion of the work that the nurses are concerned with are as follows:

The phenolsulphonaphthalein test is one of the most commonly used tests to determine the functional capacity of the kidneys. Its use is based on the fact that the drug is eliminated entirely by the kidneys and, if it is injected subcutaneously,[1] it will, if the kidneys are functioning properly, appear in the urine in five to ten minutes after injection, and about 60% of the amount injected will be recovered at the end of the one hour and practically the entire amount at the expiration of two hours. If the kidneys are not functioning properly, excretion is delayed in proportion to their disability.

The presence of the drug in the urine is indicated by a red coloration of the latter upon the addition of an alkali. The color, however, is only produced when the drug is in an alkaline medium and therefore, if the re-

[1] If the drug is given by mouth it does not appear in the urine until from one to one and a half hours after injection.

action of the urine is normal, *i. e.*, acid, there will be no indication of the presence of the drug until the alkali is added.

The usual technique is as follows: Twenty to thirty minutes before the injection of the drug, the patient is given 300 to 400 c.c. of water to insure diuresis. The bladder is catheterized and the catheter left *in place* and, noting the time, the drug is injected into, as a rule, the lumbar muscles. The free end of the catheter is inserted in a test tube containing one drop of 25% sodium hydroxid and this is watched until the urine which drops into it becomes pink on contact with the sodium; this shows the presence of the drug in the urine. The time that this occurs is recorded and, as a rule, the catheter is then withdrawn. The patient is to void urine or, if this is impossible, be catheterized in one hour and, again, two hours after the injection of the drug. The urine obtained at the different times is put into a separate bottle which is appropriately labeled and sent to the laboratory. The time at which each specimen was voided and the length of time that elapsed before a pink color was observed in the test tube should be stated on the labels and on the patient's chart.

If, for any reason, the catheter is left in the bladder, the free end is clamped as soon as the pink color is noted in the test tube. At the termination of an hour the free end of the catheter is put into a sterile bottle and the clamp opened, after the bladder is emptied the clamp is closed again. At the end of another hour the procedure is repeated using a fresh bottle. After the urine ceases to flow the catheter is withdrawn.

In the laboratory each specimen of urine is tested to determine the amount of drug contained in it.

Roche's methylene blue test to determine disturbance

of the antitoxic function of the liver[1] consists in giving the patient a capsule containing .002 gm. of methylene blue in the morning, when the stomach is empty, and collecting the urine that is passed during the next eight hours. That voided during each four hours is put into a separate bottle properly labeled and sent to the laboratory. If the liver is not functioning properly, the urine, especially that passed between four to eight hours after the administration of the drug, will be colored green. If the liver is normal, this will not be the case because this amount of methylene blue will be completely arrested by normal liver cells.

A test for the absorptive power of the stomach is as follows: The patient is given a capsule[2] containing 0.1 gm. of KI and the time recorded. In ten minutes, the patient is asked to spit some saliva on a piece of starch paper and a drop of fuming nitric acid is added to this. If conditions are normal some of the KI will have been absorbed and will be in the saliva, and the nitric acid will liberate the iodine in the KI from the potassium whereupon the iodine will combine with the starch to form a blue iodide of starch. If the color does not appear, or is very faint, the procedure is repeated every ten minutes until a distinct blue color is obtained.

There are several tests to determine the motor and secretory capacities of the stomach which consist in giving the patient certain foods, the average time for

[1] One of the important functions of the liver is to modify poisons formed in the body, especially those reaching it through the portal vein.

Where is the portal vein and what difference is there in the blood that it contains and that in other vessels?

[2] Care must be taken not to have any KI on the outside of the capsule.

the digestion of which is known, and, later, at specified times, the residue is removed by a doctor as described in Chapter XIII., and taken to the laboratory where it is examined quantitatively and by chemical tests. The motility of the stomach will be estimated by the amount of residue recovered, its secretory capacity by the change that the protein[1] has undergone and the amount and nature of the acid present. Knowledge of the acidity of the gastric contents is often of great help in diagnosing gastric conditions because hyperaciditv or hyperchlorhydria is characteristic of some abnormal conditions and subacidity or hypochlorhydria of others. Gastric ulcer is one of the most important conditions in which hyperacidity is usual and subacidity or acidity due to lactic acid, produced by fermentation of foodstuffs, is common in gastric cancer.

The following are the test meals most frequently used:

Ewald test meal consists of a roll or piece of bread or toast, in amount 35 grams, without butter, and two cups (amounting to 400 c.c.) of tea or water without milk or sugar. Tea is not used if the residue is to be examined for blood as the tannic acid in the tea interferes with the blood tests. The gastric contents are withdrawn one hour after the meal is completed and normally the residue will measure between 30 c.c. and 50 c.c.

Fisher test meal is the same as the Ewald, plus a quarter of a pound of finely chopped lean meat broiled and seasoned. The residue is removed at the end of three hours.

Boas test meal consists of six ounces of oatmeal gruel for the making of which one tablespoonful of oatmeal was

[1] It will be remembered that the stomach only furnishes enzymes to help with the digestion of proteins and emulsified fats, such as that of cream.

used. The residue is removed one hour after the gruel is eaten.

Riegel test meal consists of 400 c.c. of soup, 200 grams of beefsteak, and either two slices of bread or 150 grams of mashed potato, and a glass of water. The residue is removed in between three and four hours. The patient should be instructed to chew the meat very thoroughly.

The Ewald, Fisher, and Boas meals are given as breakfast and the Riegel meal, as a rule, in the middle of the day.

The Schmidt intestinal test diet is used for ascertaining the digestive functional capacity of the intestine and pancreas. It will be remembered that the pancreatic juice, which contains the enzymes required to promote the digestion of all classes of foodstuffs, is emptied into the intestine and thus intestinal digestion is as dependent upon proper pancreatic functioning as intestinal.

The daily diet, while the test is in progress, consists of 1.5 liters of milk; 100 gm. of zwieback; two eggs; 50 gm. of butter; 125 gm. of chopped beef (raw weight) broiled rare; 190 gm. cooked potato; oatmeal gruel made with 80 gm. of oatmeal. This is distributed through the day as may best suit the patient. All feces passed is saved and sent to the laboratory, where chemical tests are made to ascertain the degree to which the digestion of the different food constituents have been carried.

The Folin diet is used in estimating the state of metabolism; it is continued for several days and while it is in use *all the feces and urine passed* are sent to the laboratory. It consists of milk, 500 c.c.; cream (18% to 22% fat), 300 c.c.; eggs, 450 gm.; Horlick's malted milk, 200 gm.; sugar, 20 gm.; sodium chlorid, 6 gm.; water, 2100 c.c. The food is distributed through the day as best suits the patient's requirements.

The Use of Vaccines in Diagnosis

Vaccines are sometimes used as: (1) an aid in diagnosing certain diseases, especially tuberculosis and syphilis; (2) to determine an individual's immunity to diphtheria (*Schick's test*); (3) to test an individual's sensitiveness to certain proteins. Their use for the purpose first mentioned is based on the fact that normal individuals do not show reaction so quickly nor so intensely to small doses of vaccine as do infected individuals.

The vaccines, except those incorporated in a salve, are usually given by a doctor but nurses should understand the tests as they must watch for the reactions.

Tuberculin vaccine is given in several ways, viz.: 1. *Method of Koch:* for at least 24 hours previous to the test, the patient's temperature is taken every three hours. The tuberculin is injected into the deeper tissues, as described in Chapter XV., in usually either the intrascapular or gluteal region. Following the injection, the patient's temperature is taken every two hours for the length of time prescribed. A rise of temperature, even ½° C.($^9/_{10}$° F.) within a few hours is considered strong evidence that the patient has tuberculosis, but a negative result is thought to be a less reliable indication of immunity, for, in some tubercular processes, the virus may be so encapsulated that reaction does not occur. If a relatively large dose of tuberculin is used the patient, if tubercular, may have chills, fever, and general malaise.

2. *Method of Moro*, a salve containing tuberculin is rubbed into the skin (see inunction, Chapter XVI.,) preferably in the thoracic or abdominal region. If the patient is tubercular, small nodules usually appear on the area of application after about twenty-four to forty-eight hours.

3. *Method of Pirquet:* the inner side of the arm is

cleansed with alcohol and ether and allowed to dry. Two drops of tuberculin are placed in this cleansed area, about two inches apart, and the skin under each drop is scarified with a large sterile needle and the solution rubbed in with the needle and allowed to dry. A positive reaction is indicated if papules appear within forty-eight hours.

4. *Method of Calmette:* the eyelids are held apart and a drop or two of diluted tuberculin dropped in the conjunctival sac. If the patient has tuberculosis, a conjunctivitis will usually occur within six to twenty-four hours.

Luetin test for syphilis: A vaccine, known as *luetin*, is injected into the skin of the upper arm. Even in normal persons a slight erythema may appear in about twenty-four hours around the site of injection, but a positive reaction is indicated if the eruption consists of papules or pustules.

Schick's immunity diphtheria test consists in injecting a small amount of diphtheria toxin intradermally. If the person has no free antitoxin in the blood a small circumscribed area of redness and infiltration will appear at the site of injection within 24 to 48 hours. It will persist for from 6 to 12 days and be followed by scaling and later by a small brown pigmented spot.

A common method of testing for protein sensitiveness is to scarify a small area of skin and then rub a preparation of the protein to which the individual is thought to be sensitive into the denuded area. Sensitiveness is shown by the development of a localized eruption in the scarified area. **Conditions commonly due to protein sensitiveness are:** hay fever, asthma, the development of urticaria (hives) or other skin affection after eating certain foods, and an anaphylactic reaction following the injection of antitoxins or other serum.

CHAPTER IX

Baths and Packs Used for Therapeutic Purposes

The effects of cold, hot, and tepid applications, and of electric light, and of sunlight upon the body. Methods of giving: Cold and hot baths and packs, electric light baths, sun baths, salt baths, and medicated baths.

Treatments for the alleviation of diseased conditions in which water is the principal medium, as baths, packs, sprays, douches or irrigations are classed under hydrotheraphy or hydrotherapeutics, which terms are derived from two Greek words meaning *water treatment.* As a matter of fact, baths and packs and, to some extent, the other treatments mentioned are used to obtain the effects of cold or heat upon the body, and the water is used merely as a convenient medium for surrounding the body or a part of it with the desired temperature.

Cold

The physical properties of water by virtue of which it will cool a surface are: (1) Its power of readily absorbing heat; (2) the ease with which it evaporates. With cold tub baths and those packs in which the wet sheet is covered by a dry blanket it is chiefly the absorption of heat that is depended upon for cooling effects; while with sponge baths, it is principally evaporation and

with the variety of packs in which the wet cover is exposed to the air both absorption and evaporation are utilized.

The reason that evaporation will cool a surface is that it requires 536 small calories to change one gram of water from a liquid to a vapor and the necessary heat is taken from whatever the water is in contact with. The more rapidly evaporation takes place, the quicker the heat is abstracted. For this reason, when giving a sponge bath, if strong effects of cold are desired, means are taken to hasten evaporation and vice versa.

The means generally used to hasten evaporation for such purpose are: (1) To expose the body; (2) to fan it (*fanning hastens evaporation because it drives away the air containing the evaporated molecules of water and, the smaller the amount of moisture in the air, the greater the speed of evaporation*); (3) to substitute alcohol (30–50 per cent.) for water (*alcohol evaporates more rapidly than water*).

The Effect of Cold upon the System

If cold applications are not properly used they may be injurious, therefore, it is important that something of the effects of cold on the system and of the body's natural reaction to cold be understood. First it must be realized that cold, except for its power of arousing nerve stimuli, is a protoplasmic depressant. It, however, stimulates the cold spots in the skin and, as the result of this, cold applications that include any considerable portion of the body stimulate the central nervous system and induce reflex contraction of the muscles and the blood vessels, especially those of the skin. The muscular contraction increases heat production and the contraction of the superficial blood-vessels forces more blood to the internal

organs. Both of these results of cold, it can be appreciated, are very undesirable in fever, when there is already excessive heat production and a tendency to congestion of the blood in the visceral vessels; therefore the good effects procured from cold baths, etc., are very dependent upon the body's natural reaction to cold.

By reaction is meant *action in a contrary direction to that in which advance had already been made.* One of the characteristics of living matter, that is essential for the maintenance of life, is its power to respond or react to conditions that could cause destruction of protoplasm in such a way that their bad effect is overcome.

As the physiology of heat regulation is still but imperfectly understood, the exact **means by which reaction is brought about** is not definitely known, but increased heat production from any cause tends to stimulate the portions of the nervous system that induce dilatation of the superficial blood-vessels and increase the secretion of sweat. The changes in the caliber of the blood-vessels, probably the primary one induced by the cold, as well as the reaction effect, (1) improves the circulation, (2) increases the amount of blood in the skin and thereby (a) favors heat elimination and, consequently, the reduction of temperature, (b) improves the condition of the skin; (3) lessens congestion in the visceral vessels and thus aids the functioning of the internal organs; (4) increases the amount of blood in the brain which, with the nervous stimulation effected by the cold, improves the mental condition; (5) increases the number of red and white corpuscles in the circulation, this is not due to increased formation of corpuscles, but to the corpuscles being forced into the blood current from the internal vessels and other parts where the sluggishness of the blood current has allowed them to remain.

Conditions which tend to retard reaction to cold are:

1. Lowered vitality—as in old age, protracted illness, debility from any cause.

2. Extreme youth.

3. Obesity, on account of the relatively poor blood-supply of the skin characteristic of this condition.

4. Low temperature of the skin. When the heart action is weak, the skin may be cold, even when the body temperature is dangerously high.

5. Extreme nervous irritability.

6. Nerve fag. The debilitated condition of nerve centers interferes with the prompt response that is necessary for a good reaction.

7. Aversion or unaccustomedness to cold baths.

When these conditions exist measures to induce reaction are of special importance.

Conditions and treatments which favor prompt reaction to cold are:

1. Warm surroundings—do not give a cold bath in a cold room, especially to a patient who is not likely to react promptly.

2. Warming the skin before administering the cold treatment. This is usually accomplished by giving friction or by sponging the body with hot water.

3. Sudden application of the cold[1]—even when a preliminary hot bath is given the change from heat to cold is not to be gradual.

4. Keeping the feet warm during the bath.

5. Friction during and after the bath—this warms the skin.

[1] If a frog whose brain has been destroyed, but spinal cord left intact so that the reflex centers are unimpaired, is put into a basin of cold water, it will at once jump out; but if the water is tepid when the frog is put in and cooled gradually, the frog will not move.

6. Wrapping the patient in blankets and giving a hot drink after the bath.

Symptoms which show that the treatment is having a bad effect are: Intense shivering, cyanosis and increasing pulse rate.

It is not, usually, an adverse symptom if the pulse is apparently weak at the beginning of the bath for this is generally due to the preliminary contraction of the superficial arteries, and not to any real weakness of the pulsation. Neither does a lack of reduction in temperature indicate that the bath has not had a beneficial effect, if other signs of improvement are present, *i. e.*, if the pulse is stronger, the patient brighter, and restlessness has been overcome, for, especially in the early stages of diseases due to bacterial infection, while the system is still overwhelmed with the toxins, there may be little or no reduction.

Demonstration 40

The Brandt Bath

The use of the cold tub bath in the treatment of fever was introduced into Germany by Dr. Brandt in 1861, but, in this country, it did not come into general use until 1890. After that date it was very extensively used for some years, especially in typhoid fever; of late, however, cold sponge and spray baths and cold packs have, to a great extent, taken its place for these can be given on the bed or on a table the same height as the bed, to which the patient can be easily drawn, and there is considerable danger in typhoid of causing hemorrhage or perforation when lifting the patient into and out of the tub. With some patients, however, the sponge or spray

will not afford sufficient stimulus and the tub bath is then resorted to.

Purposes.—To stimulate the nervous system, improve the circulation, and reduce the temperature.

Equipment.—1. A portable bath tub about half full of water at the required temperature. The doctor orders the temperature; it is usually about 75° F., but a lower degree (70°–68° F.) is often prescribed for patients with a good physique and a higher temperature when conditions inimical to reaction exist.

2. A stretcher—those in common use are made of strips of strong webbing, about one inch in width, so latticed as to form squares with open spaces of about two inches between each strip. It is surrounded and attached to a double strip of canvas, so arranged that poles can be run through it.

3. A rubber ring or air pillow to put under the patient's head.

4. Non-absorbent cotton to put in the ears, to prevent their becoming filled with water.

5. A bath thermometer.

6. A basin containing two or three moderate sized pieces of ice, which are used to lower the temperature of the water if it becomes raised during the bath.

7. An ice cap or, instead, two wet gauze compresses for the head. The latter are cooled on the ice, one being kept on it while the other is on the patient's forehead. They should be changed every two minutes.

8. A binder to put around the patient's loins.

9. Safety pins and, if the patient is a woman, hairpins.

10. A rubber sheet to protect the bed.

11. Two cotton sheets.

12. Two towels.

13. A hot-water bag and cover.
14. A bath blanket.

Procedure.—Arrange your equipment and make sure that the temperature of the water is correct.

Pin the binder around the patient's loins.

Put some cotton in her ears.

Pin her hair up so that it will not get wet.

Remove the nightgown.

Put your watch or a clock where you will be able to see it well during the bath.

Substitute the bedclothes for the bath blanket in the usual manner.

Put the stretcher (without the poles) under the patient in the same manner as you would a sheet. Put the rubber ring under her head.

Insert the poles through the folds provided for them.

With the help of an assistant, lift the stretcher, with the patient on it, to one side of the bed.

Draw the tub to the same side. Leave room enough at the top to stand while you move the stretcher.

Turn back the bath blanket.

Take hold of the poles of the stretcher at one end, have your assistant do likewise at the other, and lower the patient into the tub; rest the poles on the hooks of the tub intended for them.

Put the ice cap or cold compresses on the head[1] and then begin to give friction at once and have your assistant do likewise.

After the legs have been well rubbed, the nurse doing this part of the body can stop and arrange the bed. Once a day the mattress should be turned and the bed entirely remade; but, during other baths, it is usually only neces-

[1] Cold is applied to the head to prevent an excessive influx of blood to the brain when the superficial vessels are contracted by the cold.

sary to tighten the rubber and draw sheet and fold the upper covers neatly at the foot of the bed. Fold the bath blanket and hang it across a bar of the bed or over the back of a chair, put the pillow in place. Cover the bed, including the pillow, with a rubber sheet and over this, on the half farthest from the bath, place half of a muslin sheet; let the other side hang free but tuck a little of it loosely under the mattress in one or two places, so that the sheet will remain in place (this side is put over the patient when she is removed from the tub). Place a covered hot-water bag at the foot of the bed under the folded covers.

Arrange the bed as quickly as possible and then begin to rub the patient again.

The nurse giving friction to the upper part of the body must rub the back particularly well. When a patient has typhoid, the abdomen is not to be rubbed.

Feel the pulse every two or three minutes. As previously stated, the pulse may appear weaker for a time, on account of the contraction of the superficial arteries, and it may be more rapid, as the result of the sudden stimulus to the nervous system, but it usually soon becomes slower; should its rate be much increased and the patient become cyanosed she should be removed from the bath and the doctor notified.

Except in emergency, before removing the patient from the bath, to prevent exposure, stretch a sheet lengthwise, rather loosely, across both bed and tub; tuck one end under the mattress,[1] pin the other to the stretcher hooks.

Unpin the binder; leave it in the tub for the present.

[1] The portion of sheet that is hanging at the side of the bed need not interfere with your doing this, for it can be gathered up loosely between this sheet and the mattress.

Raise the stretcher and hold it for a few seconds above the tub to drain off the water. Then place it on the side of the bed nearest the tub.

Unpin the sheet that is fastened to the stretcher hooks and move the tub out of the way.

Take out the stretcher poles.

Go, with your assistant, to the other side of the bed and draw the patient over on to the sheet that is covering the rubber on that side. Turn the free end of this sheet over her under the one that was used to prevent exposure during lifting. Remove the latter.

Dry the patient by rubbing over the sheet in which she is enveloped and with a towel. Remove the cotton from her ears.

Cover her with the bath blanket and turn down the part of the sheet covering her.

Go to the other side of the bed, roll the rubber to the patient's side, and then, with your assistant's help, draw her to the center of the bed.

Turn her slightly while you remove the rubber and sheet, and if she is shivering slip a part of the blanket under her back.

Wrap the blanket loosely around her feet and legs; put the hot-water bag near her feet and the ice cap near her head.

Draw up the covers and, if the patient is shivering, under the bed clothes, but over the blanket, give friction while your assistant gets her some hot broth.

Remove your equipment and disinfect it according to the hospital rules if the patient has an infectious disease.

Remove the blanket when the patient ceases to shiver or feel very cold and put on the nightgown.

Take the temperature and count the pulse and breathing one half hour after the bath.

In addition to their use in fevers, **cold tub baths are used also as nerve and circulatory stimulants in neurasthenia and general debility,** and to, by accustoming the system to react to cold, overcome abnormal tendency to "colds." When they are used for these purposes, the patient is, as a rule, not confined to bed. In such case, the nurse's most important duty will be to see that conditions which will assist reaction are present, especially that (1) the bathroom is warm and (2) the patient warm when she enters the bath. Also, when the patient is not accustomed to taking cold baths and dislikes them, or other conditions unfavorable to prompt reaction exist, it is well to provide a warmed bath blanket or bathrobe or sheet in which to envelop her the moment she steps from the bath and to dry her quickly, with a warmed towel, under this wrap.

When the bath is given without friction, the patient usually only remains in it two or three minutes; in fact, for the first few baths the duration prescribed may be half a minute, and, especially for an elderly person or one who for other reason has high blood pressure, the temperature prescribed for the first few baths is comparatively high (about 80° F.), for it can easily be appreciated that as cold baths increase blood pressure, they might be dangerous in such a condition unless the system was accustomed to them.

Sometimes, when a full cold bath is thought to be too strenuous a treatment, a partial bath is prescribed; for example, bathing the face and chest with cold water or, when the circulation in the lower limbs is poor, as evidenced by the feet being constantly cold, plunging the feet and legs into cold water and dashing the water over the thighs while the upper part of the body is kept warm.

Demonstration 41

Cold Sponge Baths

Method 1. Equipment: 1. A heavy double-faced rubber sheet, that is in *perfect condition.*

2. A strip of bath blanket or of muslin or a bath towel.[1]

3. Two towels.

4. A loin binder, and for a male patient, safety pins.

5. A large wash cloth, preferably of Turkish toweling about eighteen inches square.

6. Two hot-water bags and one cover. One hot-water bag is left uncovered and the water in it is not to exceed 120° F.

7. A foot-tub or large basin half full of water the required temperature, usually between 70° and 80° F.

8. A bath thermometer.

9. A basin containing one or two rather small pieces of ice; this is to lower the temperature of the water if necessary and, if compresses are used, to keep them cold.

10. An ice-cap with cover or else two wet gauze compresses.

11. A bath blanket.

12. A subject; the demonstration doll, if covered with water-proof material, can be used for the purpose, but the pupils are strongly advised to, when practicing, take turns "being patient."

[1] This can be omitted if the patient is in stupor; it is only used because patients who are conscious are likely to object to lying on the rubber, but its presence makes it much harder to remove the rubber after the bath without wetting the bed. It is because of the difficulty of doing this that a narrow strip of material is better than a sheet. A hemmed strip (about two feet by five) prepared from an old cotton bath blanket is excellent for the purpose.

Procedure.—Replace the top covers with a bath blanket in the usual manner, described Chapter V.; leave the covers folded at the foot of the bed or else draw them out over chairs placed just beyond the foot of the bed that they may air.

Cover the bedding, including the pillow, and the covers that have been folded across the foot of the bed, with a rubber sheet. This is usually best done as follows: Draw the patient to one side of the bed, cover the other half with the rubber, placing the part which is to cover the portion of bed on which the patient is lying folded against and, as far as possible, under her side.

Cover the part of the rubber on which the patient is to lie during the bath with the strip of bath blanket; put one edge of this under the folds of rubber so that it will not be pulled out of place when the patient is moved.

Move the patient to the center of the bed and draw the rubber over the remainder of the bed.

Remove the nightgown.

If the patient is a man, have the orderly pin a binder around his loins, if a woman, cover the pubic region with the binder, leaving the latter longer on one side than the other so that it will fall behind her when she is turned.

Place the ice-cap on the head, the uncovered hot-water bag near the feet and the covered one under the covers at the foot of the bed.

Put the bath thermometer in the water and note its registration. If the temperature is not correct rectify the defect.[1]

[1] The following schedule of bath temperatures for different degrees of body temperature is commonly observed when the doctor does not state the degree that he desires, except that, if the patient's condition

Place your watch where you can see it easily.

Count the patient's pulse and note its character.

Give light friction for about two minutes over the entire body, avoid exposure while doing so. While giving friction hold the wrists and fingers loosely and move the hands quickly and lightly, backward and forward, taking short strokes.

Sponge the face and dry it with the face towel.

Fold back the bath blanket sufficiently to expose half the body, this may be either a lateral half or the chest.

Proceed with the bath: Begin to sponge high on the neck; hold the wash cloth bunched so that there will be no wet tails left to drag over the body; squeeze the water from the wash cloth over the body, as you sponge; take long, slow, sweeping, downward strokes.[1] If you have no assistant sponge with one hand and give friction with the other and periodically stop the sponging and give friction over the entire body for a minute. Wet the

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is likely to interfere with reaction a temperature as low as 65° F. is not generally used.

Mouth temperature	Rectal temperature	Bath temperature
102.5° F.	103.5° F.	90° F.
103° "	104° "	85° "
103.5° "	104.5° "	80° "
104° "	105° "	75° "
104.5° "	105.5° "	70° "
105° "	106° "	65° "

[1] A common error in giving sponge baths is to rub upward with the idea that this helps the venous circulation, but the pressure usually made with the sponge is not sufficiently pronounced to affect the circulation and, as the upward stroke rubs against the skin hairs, it tends to promote irritation of the skin. It is true that in giving friction an upward movement is made but the effect of the light, rapid stroke used in giving friction is quite different from that produced by the heavier pressure used in sponging.

sponge frequently in the cold water and mop that in the rubber up with it from time to time; squeeze the latter from the cloth into the basin and, as this will soon raise the temperature of the water in the basin, watch the thermometer and, when necessary, put in a small lump of ice until the temperature is reduced (*do not let the patient see you doing this, in fact it is well not to let her see the ice at all*). While giving the bath, keep the patient's arms away from her sides and sponge the axillæ frequently. The doctor states the length of time that he wishes the bath continued. This is usually between ten and twenty minutes. After about one third of the time has passed cover the part of the body that has been sponged and then expose and bathe the other half for an equal length of time, turn the patient toward you and support her with one hand while you alternately rub and sponge her back for the remainder of the time, or, if you have an assistant, let her turn and support the patient and give friction while you do the sponging and, if the patient shivers, rub the thighs and legs with your free hand.

With the patient still turned, mop the water from the rubber.

Dry her back and uppermost shoulder and then, as well as possible, the rubber behind her. Roll that side of the rubber up to her back, spread one side of the dry bath blanket over the uncovered portion of the bed, and turn the patient onto this and exchange the binder for a towel.

Remove the uncovered hot-water bag.

Wipe the other side of the rubber, roll it toward the center; turn the top and the bottom toward the center, and, holding it carefully, so as not to spill any water that may have been left on it, remove it from the bed and

place it in the basin. The reason for folding the rubber in this way is that, if there is any water remaining, it will be in the center and will not be spilled on the bed or floor.

If you have an assistant, let her dry the patient while you are attending to the rubber. If you are alone, get the rubber out of the way as quickly as possible, dry the patient, and, as you pull the free end of the blanket over her, remove the towel which you used to replace the binder.

Put the hot-water bag at her feet and the ice-cap on her head.

Draw up the covers.

The after-treatment is the same as that following the tub bath.

During the bath, watch the patient's pulse and general condition constantly.

Method 2. The main difference between this method and Method 1 is that the rubber sheet[1] is raised along the sides and at the foot and thus water can be used more freely when giving the bath.

Equipment.—The same as for Method 1 plus an empty pail and two large, old blankets, both of which should be rolled and, if necessary to keep them so, pinned or tied with string, or, instead of the blankets, heavy twine and four clothespins.

Only one bath blanket will be needed.

Procedure.—Same as Method 1 with the following exceptions:

After the rubber sheet is in place, put a rolled blanket under it on each side, or else tie a piece of heavy twine on each side to bars at the head and foot of the bed, at the

[1] Unless this sheet is of heavy rubber, two had better be used, one under the other. When two are used they are placed together and put under the patient at the same time.

desired height, and secure the sides of the rubber over the cord with clothespins as shown in Fig. 31.

Remove the bath blanket, fold, and place it under the rubber at the foot.

Squeeze the water over the patient from the wash cloth, until there is a considerable amount around her. Then scoop the water up with the hand and rub it over the patient; do this alternately with friction and from time to time mop the water up with the cloth and squeeze it into the empty pail and put fresh water over the patient. If the water in this pail is to be used again, cool it with ice, to the required temperature.

As there will be so much water in the "bath" it will be better to turn the patient slightly two or three times and rub her back, rather than keeping her turned for a longer period at one time.

As in Method 1, it is well to have an assistant, if possible, especially if the patient is not likely to react readily, for the friction can then be continuous and this helps very considerably in preventing shivering.

Demonstration 42

Spray Bath

This is frequently used instead of the sponge bath because the percussion effect of the spray upon the skin helps to induce a speedy reaction.

Equipment.—Same as for the sponge bath (Method 2) with the following exceptions and additions:

The rubber sheet must be long enough to extend from the top of the pillows to about four inches[1] into a pail placed at the foot of the bed.

[1] If the rubber extends too far into the pail it will be in the way if it is too short it may be pulled out of the pail during the bath. If

The water for the bath should be in a four-gallon irrigator or pail, instead of a basin or tub, and this is to

Fig. 31. Rubber sheet arranged for spray bath.

be stood on a stand that is between twelve and eighteen inches higher than the bed.

If an irrigator is used two empty pails will be required, otherwise, one will be enough.

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a long rubber cannot be obtained, two can be used and the upper edge of the lower one inserted about twelve inches under the upper one.

A rubber, about a yard square, to put on the floor under the pail that is to catch the water from the bath.

A bath spray with, if an irrigator is not used, a funnel inserted in the open end.

A small pitcher containing water the same temperature as the bath. This is used when starting siphonage and will not be needed if an irrigator with an opening at the base is used.

Blocks or other appliance for raising the head of the bed about two inches.

Procedure.—This is about the same as for the baths previously described, but the water is sprayed over the body and more is allowed to accumulate in the rubber and, instead of mopping it up, when enough has collected, it is allowed to run slowly into the pail placed at the foot of the bed, the wash cloth being used only to dry the rubber before removing it. To facilitate drainage the head of the bed is raised slightly, about two inches, and, to prevent drainage until it is required, the sides of the rubber of the improvised tub are brought near together at the feet and the hot-water bag is placed in the opening. The blanket is not put under the rubber at the foot of the bed.

While giving the bath, hold the spray in one hand and move it back and forth above the body while, with the other hand, you give friction and from time to time scoop up some of the water that is in the bath and rub it over the patient. Turn the patient very slightly, every once in a while, alternating the sides, and rub her back.

After about half of the water has run from the reservoir open the sluice at the foot sufficiently for the water to run slowly from the bath and, if it is necessary to re-use that water, put a small piece of ice in the pail and leave it

until the temperature of the water is reduced to the desired degree. If possible have an assistant to do these things, for the friction ought not to be interrupted.

To remove the bath, drain off the water as well as possible, let down the sides and wipe the rubber. Turn the patient on her side, roll the rubber to her back and proceed as when giving a sponge bath, with the exception, after the sides of the rubber have been rolled to the center, of folding it downward and putting it into the empty pail.

If you have not an assistant, endeavor to do this work particularly quickly but, if the patient is shivering, stop for a few seconds occasionally and give friction over the body.

Siphonage.—The only difficulty in giving this bath is in starting siphonage, when a pail is used instead of an irrigator. However this is easy enough once one acquires the knack and this merely requires practice and an understanding of the principles involved. These are: If a tube is filled with water and one end placed in a reservoir containing water, the other end, which must be of greater length than the part in the reservoir, hangs downward, the difference in the lengths of the upward and downward extensions of the tube will cause the pressure of the water in the tube to be unbalanced and this and the atmospheric pressure upon the surface of the water in the reservoir will force the water through the tube, even though it must flow at first against gravity—*i. e.*, upward.

Since the unbalanced pressure within the tube is one of the primary factors in siphonage two essentials in the procedure are: (1) The reservoir must be high enough to allow of the free end of the tube being longer than that within the pail and the greater the difference in length the

greater the force with which the water will flow. (2) The tube must be filled with water and means taken to keep it full until the flow is started. One method of doing this is to insert a funnel in one end of the tube and pour water into it, keeping the free end of the tube compressed to prevent the escape of the water, it can be compressed by raising it and pressing it firmly against the stem of the funnel or between the fingers. When the tube is filled compress both ends (to keep it filled) and lower the funnel into the water and the free end over the surface that it to be sprayed, then release the pressure on both ends simultaneously.

Two conditions likely to interfere with siphonage during the bath are: (1) Pulling the funnel above the water; (2) allowing the tubing to become bent upon the edge of the pail.

Demonstration 43

Alcohol Baths

As alcohol evaporates more rapidly than water it cools the skin more readily and causes greater stimulation of nerve-endings. Therefore, good effects can be obtained with the use of a smaller amount of alcohol than of water and, for this reason alcohol baths are given more especially when it is not desirable to move the patient enough to protect the bed sufficiently to allow the use of much water.

Method 1.—This method is used when the patient is not to be turned.

Equipment.—1. Three strips of cotton blanket or three bath towels.

2. A dressing towel.

3. A dressing basin containing about one quart of alcohol, thirty per cent., of the required temperature (see foot-note, page 266).

4. A basin containing water about ten degrees lower than the alcohol.

5. A basin containing some small pieces of ice.

6. A bath thermometer.

7. A covered ice-cap.

8. A fan.

9. A covered hot-water bag.

10. A bath blanket.

Procedure.—Exchange the top covers for the bath blanket in the usual manner, folding the former to the foot of the bed.

Tuck a strip of bath blanket or a bath towel under the patient at each side and place another one under her legs. Place the legs so that they will not be in contact during the bath and put the arms away from the sides.

Put the ice-cap on the head and the hot-water bag (covered) at the feet.

Remove the nightgown.

Fold two dressing towels and put them in the water.

Put your watch where you can easily see it during the bath.

Count the patient's pulse and note its character.

Wring out one of the towels that you put into the water and place it (folded) over the abdomen and pubic region.

Fold the bath blanket down to the foot of the bed. You can leave a portion of it over the feet and legs if conditions inimical to reaction exist.

Begin to sponge; usually, in giving alcohol baths,

it is well to give each part of the body its full share of sponging at one time; *e. g.*, if twenty minutes is the time limit prescribed for the bath, sponge each part for four minutes as follows: (a) half of the chest and one side and arm; (b) the entire leg of the same side; (c) the other half of the chest, side and arm; (d) the other leg; (e) the back. To do the back, when the patient is not to be turned, raise her slightly on one side and sponge as much of it as you can for two minutes and then do likewise on the other side.

During the bath observe the following points:

In sponging use long, downward, sweeping strokes.

Change the towel on the abdomen every four minutes and keep the one not in use in the cold water.

Give friction if the patient shivers.

Keep constant watch of the patient's pulse and general condition; if these remain good, fan her, at the completion of the bath, until she is perfectly dry. Otherwise dry her with a towel.

After the bath is completed, draw up the bath blanket, remove the wet towels and those protecting the bed, and proceed as after the other baths.

Method 2.—Equipment.—The same as for Method 1 with the exception of a rubber sheet (this need not be a heavy one) and, if the patient is conscious, a strip of bath blanket or muslin, instead of the three bath towels or substitutes used to protect the bed.

Procedure.—This is the same as for Method 1, except (1) put the rubber, covered if necessary, under the patient in the same manner as for the Method 1 sponge bath with water; (2) as the bed is more efficiently protected use the alcohol more liberally; (3) turn the patient well over on one side while you are sponging her back and dry it by fanning.

Demonstration 44

Cold Packs

Purposes.—These are the same as those of cold baths and, given according to method 2, the pack is also used to lessen nervous irritability and induce sleep.

The methods here described are ones that are very commonly used but they are only a few of the many ways of giving cold packs.

In Methods 1 and 3 rapid evaporation is the chief action depended upon to assist the results of nerve reflexes in cooling the body though there will be some absorption of heat; in Method 2 it is the absorption of heat by the water that is relied upon and, to get the best effects, evaporation, except during the alcohol rubs, is inhibited as far as possible.

Method 1.—Equipment.—1. A foot tub or large basin half full of water the required temperature. This is specified by the doctor; it is usually between 70° and 85° F., the higher temperatures being used for those who are not likely to re-act promptly.

2. A bath thermometer.
3. A rubber sheet.
4. Three small muslin sheets.
5. An ice-cap.
6. A hot-water bag in a cover.
7. A whisk or, better, a small watering can, a child's toy watering can is the best as the holes in the sprinkler are small and, in the pack, unlike the bath, only a small amount of water is used at a time.
8. A bath blanket.
9. Two towels.
10. A binder.

Procedure.—In turn, open each sheet and gather it loosely, lengthwise, and put it in the water.

Replace the top bed-covers with the bath blanket in the usual manner, folding the covers to the foot of the bed.

Move the patient to the side of the bed farthest from the tub and turn her on her side.

Cover the vacant part of the bed, including the pillows and the covers at the foot with the rubber sheet, leaving the part that is to cover the remaining portion of the bed folded against the patient's side.

Wring the water out of one sheet. To do this, pass one wrist under the folds of sheet at about the middle

Fig. 32. Wringing sheet.

of its length (see Fig. 32), grasp the sheet with both hands near this point and twist in opposite direction with each

hand. When the water has been squeezed from this portion let it hang outside the tub and grasp and squeeze the adjacent part, repeat as often as necessary.

Spread this sheet out on the rubber putting one edge of it under the folds.

Turn the patient onto this sheet.

Put the hot-water bag at her feet, the ice-cap on her head and the binder over the pubic region.

Wring the water out of the other sheet and then, with one hand, turn the blanket down from the chest; replace it with the wet sheet.

Open out the wet sheet, turn the blanket from the lower part of the body, draw down the sheet, put it between the thighs and legs and place these apart. On each side draw a portion of one of the wet sheets around the arm.

(N.B. Every part of the surface of the body is to be in contact with a wet sheet and no two body surfaces are to touch each other at any point.)

The patient remains thus for the length of time prescribed by the doctor (this is usually fifteen or twenty minutes), during this time, give friction over the sheet, turning the patient from time to time and rubbing the back. When the sheet gets warmed, sprinkle it, either with a watering-can, holding it a considerable distance above the patient, or by splashing water from a whisk.

To remove the pack.—Take off the upper sheet, dry the patient's chest, sides, arms, and legs, tuck the bottom sheet somewhat under her (so that it will not wet the bath blanket when it is drawn up), and dry the rubber on both sides.

Pull up the bath blanket.

Roll the rubber to and, if possible, somewhat under the patient on one side.

Make sure that the patient's side is dry and then turn her over on to the bed.

Roll the rubber from against the patient's back sufficiently to get it out of your way and then wipe her back.

Then, unless you have an assistant who can do so while you are drying the patient, roll up the other side of the rubber and, with it, the sheet toward the center and fold them from the top and bottom to the center and then remove them, being careful not to let any water that may remain drip on the bed or floor. There is frequently much more water left on the rubber than might be expected.

Draw up the bed-covers. If the patient is shivering, rub her over the bath blanket and tuck this around her. Leave the hot-water bag at her feet and the ice-cap on her head.

The remainder of the treatment is the same as after cold baths.

Method 2.—Equipment.—This is the same as for Method 1, plus a second blanket and a bottle of fifty per cent. alcohol[1] and minus the watering-can or whisk. Cover the rubber sheet with the bath blanket (which should be a large one) with the latter extending four inches above the rubber at the top—*i. e.*, the part that is to go under the patient's head—and roll or fold the two together before bringing them to the bedside.

Procedure.—With the exception of having the blanket covering the rubber and placing these so that the rubber comes two inches and the blanket four, above the patient's neck, proceed as in Method 1 as far as, and including, covering the patient with the wet sheet and bringing

[1] The alcohol used must be at least 50 per cent. so that it will evaporate quickly.

the sheets around her arms and legs. As in Method 1, no two surfaces of the body are to be in contact and except for the head and feet, the patient is to be completely surrounded with wet sheets.

Do this work as quickly as possible so that the patient will not chill and then bring up the side of the blanket that is farthest from you over the patient; bring the upper edge obliquely across the chest so that it will fit snugly around somewhat more than one half of the front of the neck and, to secure it, make a fold in the side of the blanket (see Fig. 33), stretch it tightly and tuck it under the patient all along the side on which you are standing. Go to the other side of the bed, and treat the opposite side of the blanket in like manner. Tuck an edge of a towel between the blanket and the patient's neck.

(N. B. *The blanket is to be very firmly drawn around the patient, especially at the neck and feet so as to prevent the circulation of air over the wet sheets, for this will cause rapid evaporation and favor chilling, which is to be avoided.*)

Draw up the bath blanket which you folded to the foot of the bed and tuck it under the patient's shoulders and sides and around her legs.

See that the hot-water bag is in place at the feet and if the patient is shivering draw up the covers, but fold them down again as soon as she ceases to do so.

Count and note the character o the patient's pulse and observe her general condition. She may feel cold and even shiver slightly for about five or ten minutes, but if, at the end of this time, she does not feel warm, the doctor should be notified.

The doctor prescribes the length of time that the patient is to be left in the pack. This is usually thirty or sixty minutes or longer if she goes to sleep when the pack is given for sedative effects. If it is used to

FIG. 33.—METHOD OF FOLDING BLANKET AROUND A PATIENT WHEN GIVING A PACK.

reduce temperature, the upper sheet is changed every ten minutes.

To remove the pack: Turn down the bed-covers, but leave the bath blanket in place; under this, fold down the sides of the other blanket; remove the wet sheet covering the patient, turn the patient on her side and rub her back with alcohol, using a liberal supply, pour the alcohol on to your hand from the bottle. Rub the back until it is dry.

Go to the other side of the bed, roll the wet sheet, blanket, and rubber together, into as small a fold as possible, up to the patient; turn her over on to the uncovered portion of the bed.

Remove the rubber, etc.

Turn the covering bath blanket down below the chest and rub the latter with alcohol. When this has evaporated, put on the nightgown.

Turn the blanket over the chest and off the legs and rub these with alcohol.

Draw up the covers and remove the bath blanket at the same time.

If the patient has fever, take her temperature half an hour after the bath, but, though this pack is used in hyperpyrexia, especially with patients who do not react readily to cold, its more common use is in the treatment of abnormal nervous conditions.

Method 3.—This method is used when the patient is not to be turned and the applications are made to, except the legs and arms, the anterior surface of the body only. It is very frequently used in the treatment of surgical patients who have a high temperature. In such cases, cover the surgical dressing with oil muslin or rubber tissue that it may not become wet.

Equipment—1. A large basin containing water the temperature that has been ordered; this is usually

between 68° and 85° F., the higher temperatures being, as usual, for people who are not likely to react well.

2. Three strips of cotton blanket or bath towels.

3. Several face or dressing-towels, the number depending upon their size; usually seven or eight are required.

4. A bath thermometer.

5. A basin with a few small pieces of ice.

6. An ice-cap.

7. A hot-water bag and cover.

8. A binder.

Procedure.—Put the towels in the water.

Prepare the patient as for an alcohol sponge, Method 1.

Wring the towels, in turn, fairly dry and put them around the arms and over the chest and abdomen and then around the legs. Keep one in the water with which to start changing those on the body. Change them in turn, one every minute, and rub the body over the towels between times. Otherwise, continue as for Method 1 pack.

Hot Baths and Packs

The Action of Heat

Heat is a stimulant that is necessary for life and, when the body's vital activities are depressed, to surround it with heat is one of the first and most important requisites. But, when heat is excessive, it produces changes in tissue protoplasm that cause its destruction and, even when not intense enough to do this, it can, by interfering with heat elimination,[1] cause a rise of body

[1] Heat, it will be remembered, is eliminated chiefly by the skin by radiation and evaporation. If the air or other medium surround-

temperature which will induce changes, the nature of which are not well understood, that may cause death. However, a degree of heat that would cause death if long continued, may be borne by the body for a short time, and in certain abnormal conditions some of its effects are of great therapeutic value.

Purposes of the therapeutic use of hot baths and packs.—

1. To induce diaphoresis (*sweating*) and thus (a) when the kidneys are not functioning properly, aid in the removal of salts and protein waste from the body; (b) lessen obesity—*diaphoresis will have this effect because it promotes the need of water in the body which hastens the catabolism of fat which yields water;* (c) reduce edema—*diaphoresis, by removing water from the blood, increases its concentration and this favors the passage of fluid from the tissues into the blood-vessels;* (d) lower blood pressure.

2. Relax excessive muscular contraction, *e. g.*, in convulsions.

3. To relieve congestion of the internal organs and mucous membranes, by increasing the amount of blood in the skin.

4. To hasten the outbreak of the rash in measles and other exanthemata—*this effect is probably produced by increasing the amount of blood in the skin.*

5. To relax stiff joints—*heat causes the softening and*

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ing the body has a higher temperature than the body, the loss of heat by radiation will be lessened, but, within fairly wide limits, so long as the surroundings are dry, ill effects from this will be averted because of the diaphoresis induced by the heat and the consequent increased evaporation also loss by evaporation will be retarded. This is one reason why Turkish (hot-air) baths can be taken at higher temperatures than Russian (vapor) baths and why heat is so much harder to stand on a humid than on a dry day.

expansion of the fibrous tissues composing the tendons and ligaments surrounding the joints.

6. To reduce local inflammations—*this result is promoted by* (a) *the hyperemia produced in the part exposed to the heat, which increases the amount of phagocytes, etc., in the part and thus favors the destruction of bacteria;* (b) *hastening the absorption of inflammatory exudates;* (c) *improving the circulation in the part.*

The varieties of hot packs are dry and wet and the combined bath and pack. For systemic effects the whole body, except the head, is enclosed in the pack, but, for local effects, as a rule, only the affected area is included.

The varieties of hot baths in common use are the hot water bath, the hot air or modified Turkish bath, the vapor or modified Russian bath, electric light and sunlight baths.

Bad results that must be guarded against when giving hot packs and baths are:

1. Burning the patient. This for obvious reasons is most likely to occur with packs and vapor and electric light baths.

2. Fainting, due to withdrawal of blood from the brain into the relaxed skin vessels.

3. Collapse, caused, as a rule, by the reduced blood pressure.

4. Chill. This is usually occasioned by (a) exposure to a comparatively low temperature during or too soon after the treatment; (b) insufficient drying of the skin. The chill in both cases will result from the cold produced by evaporation, this not being intense enough to call forth the reflexes which give rise to reaction nor associated with the necessary auxiliary treatment.

5. Headache, resulting chiefly from the effects of the heated blood within the cerebrum.

The measures employed to avert such results are:

To avoid burning patients (a) always take the temperature of the water with an accurate thermometer and be sure that it is the required degree; (b) when adding water to a bath after the patient is in it always hold your hand between the patient and the stream of hot water; (c) when giving wet packs, wring the blankets as dry as possible, and (d) never put the hot-water bags next to the wet blanket, for this may generate steam. The special care necessary during local hot baths will be given in the section describing the methods of their administration.

To prevent fainting and collapse (a) keep patients quiet during and for some time after treatments and do not allow them to sit or stand up suddenly; (b) unless there is edema or the treatment is given to reduce obesity give liquids by mouth liberally, for the loss of fluid from the blood, as already said, helps to reduce blood pressure and this is usually the chief cause of collapse. Of course drinks are withheld or given sparingly when there is edema for the blood can then get the liquid from the tissues and it will not do so. as desired, if liquids are taken by mouth. Neither are drinks to be taken when the treatment is to reduce obesity, since they would prevent the accomplishment of the object of the treatment.

To prevent chilling avoid exposing the body to the air during and immediately following the hot treatment and, after sweating ceases, give an alcohol rub or cold spray to promote the reactionary effects of cold described in the preceding section and thereby increase muscle tone and improve the circulation. It is to be realized that the reaction effects obtained by the sudden application of cold associated with treatment to promote

reaction are not likely to be induced by the chilling of the body surface that will probably occur if the body is exposed to the air while the sweating is profuse.

To avert headache keep an ice-cap on the head during and for some time after the hot treatment.

Signs that heat is having an undesirable effect are: Feelings of faintness and dizziness, increasing frequency and weakness of the pulse. The pulse is likely to become somewhat softer and more frequent on account of the relaxed condition of the blood-vessels, but, if the change is pronounced and associated with the sensations just mentioned, the treatment must be discontinued, the patient wrapped in a dry blanket and rubbed with alcohol, and the physician should be notified.

Demonstration 45

The Hot Bath-Pack

In hospitals equipped with a hydrotherapy room this treatment is generally given there, the patient being taken from and returned to the ward on either the bed or stretcher, but it can be very easily given in the ward and demonstration room.

Equipment.—1. A portable tub about half full of water of the required temperature. The temperature is of course ordered by the doctor; a common prescription is 104° F. to begin with and an increase to 106°, 108°, 110°, and even, if the patient is not depressed by the lower degrees, 115° F. Unless the bath is prepared at the bedside, the first temperature will need to be a degree or two higher to allow for cooling in transportation.

2. A large bucket or hose for conveying the hot water required to raise the temperature.

3. A bath stretcher.
4. A rubber ring or air pillow.
5. An ice-cap with cover.
6. A bath thermometer.
7. Three cotton bath blankets.
8. One heavier blanket.
9. Two rubber sheets.
10. A rubber pillowcase.
11. Five covered hot-water bottles.
12. A loin binder and safety pins.
13. A bath towel and a dressing towel.
14. A bottle of alcohol 50%.
15. A subject.
16. If the use of liquids during the treatment is not prohibited, a tray holding a pitcher of lemonade or other beverage, either hot or cold, a glass or cup, and a drinking tube.

Procedure.—See that the temperature of the bath water is correct.

Feel the patient's pulse.

Replace the upper bed covers with a bath blanket, remove the nightgown, and pin a binder around the groin.

Move the patient on to the stretcher and lift her into the bath in the same manner as described for the Brandt bath.

Place the ring under and the ice-cap on her head.

Feel her pulse now and from time to time during the bath.

The time prescribed for the bath is, usually, fifteen minutes. After one third of this time has elapsed start pouring in hot water and do this at intervals until the maximum temperature ordered by the doctor is attained; unless otherwise directed, this should be reached before

two thirds of the bath time has passed. Pour the water used to increase the temperature in at the foot of the tub and *keep your hand between the stream and the patient*, alternately with pouring, from time to time facilitate the mixing of the added water with that in the tub by moving your arm through the water. The temperature of the added water must depend upon the relative size of the tub and the patient, if there is room to allow sufficient space between your hand and the stream of water, it can be almost boiling.

While the patient is in the tub **prepare the bed,** and do this as soon and as quickly as possible, for it may be necessary to take the patient out of the bath before the prescribed time has elapsed. Unless this seems probable strip the bed, turn the mattress, and make an open bed in the usual manner with the upper covers folded to the foot. Unless the patient is troubled with dyspnea or other reason exists why one pillow under the head will not suffice, provide only one. Put the rubber pillowcase on under the white one.

Then, cover the bedding with the rubber and this with a bath blanket, on top of this spread the thicker blanket and on this a bath blanket. Place all the blankets so that they will extend about two inches above the patient's neck and below her feet.

Place the hot-water bottles near the center of the bed, but a little bit farther to the side opposite the tub. Cover these with the remaining bath blanket.

Cover the side of the bed next the tub (over the three blankets, but not that covering the hot-water bottles) with a rubber.

When the bath time is just about over, remove the hot-water bottles and put the blanket covering them

across the bed and tub as you did the sheet to prevent exposure in the Brandt bath (see page 261).

Unpin the binder, leave it in the tub for the present.

Raise the stretcher and place it on the part of the bed covered with the rubber.

Loosen the blanket from the tub and move the latter out of the way. Dry the patient as well as possible by rubbing her over the blanket. This need not be very thorough, it being far more important not to expose the patient and to get her wrapped in the blankets as quickly

Fig. 34. Manner of folding blanket over shoulders in hot pack.

as possible, for these will, in any case, soon become wet with perspiration.

Draw the patient off the stretcher to the center of the bed. Remove the stretcher and the rubber under it.

Draw up the sides of each of the two top blankets that are under the patient and, separately, tuck them around her in the same way that you tucked the blanket for the cold pack, Method 2; being careful to draw the blankets particularly snugly around the shoulders and the feet. Do all this under the blanket that you put over

the patient before she was taken from the bath and then remove this blanket.

Put a towel under the edge of the blankets around the neck.

Put the hot-water bags along the sides and at the feet and then draw up the sides of the lower blanket over these and the patient. This need not be wrapped quite so snugly as the other blankets.

Draw up the covers.

Replace the ice-cap on the head.

Count the pulse and note its character. Record this and the patient's general condition during the bath as soon as possible.

Put away the bath equipment and hang the blanket where it will dry.

If liquids are not prohibited give between 1 and 2 ounces of lemonade or other beverage at least every 10 minutes. If a patient who is not allowed to have a drink suffers from thirst, let her rinse her mouth with ice water as often as necessary, but see that she does not swallow the water.

The pack is usually continued for from ½ to 1 hour. When half the time has elapsed remove the hot-water bags. At the end of the period remove the two blankets next the patient; do this under the cover of the outer one and be careful to avoid exposure.

Give an alcohol rub, using a liberal amount of alcohol.

Draw up the bed covers, leaving the rubber and the bath blanket covering it in place with the sides of the latter loosely over the patient until she ceases to perspire profusely. If she does not do so soon give another alcohol rub. As soon as diaphoresis ceases, remove the blanket and rubber and put on the nightgown.

Demonstration 46

The Hot Wet Pack

Method 1

Equipment.—1. A foot tub or large pail.

2. A safety pin.
3. Two rubber sheets.
4. Five hot-water bottles.
5. Five bath blankets.[1] One of these should be old and thin.
6. One thick blanket.
7. Five hot-water bag covers.
8. Ice-cap with cover.
9. Bath towel.
10. Face or dressing towel.
11. Alcohol 50%.
12. If liquids are not prohibited, a tray containing a pitcher of lemonade or other beverage, either hot or cold as the patient prefers; a glass or cup, and a drinking tube.

Procedure.—Half fill the bathroom bath tub with water 180° F.

Double one of the bath blankets and fanfold it lengthwise, fanfold another one crosswise; submerge them both (except two corners diagonally opposite each other of each blanket) in the water; pin the four corners over the faucet. This is to keep enough of the blankets out of the water to supply dry places to hold when wringing the blankets. Some hospitals supply wringers, made of crash or ticking, with a hem at each end through which

[1] The blankets should be warm. If there is no blanket warmer, they can be heated by hanging them over a radiator or rolling them around hot-water bottles.

sticks can be passed for wringing the blankets, but these are unnecessary and as this form of wet pack is very commonly used in "private nursing," where a wringer could not easily be obtained, it is much better for nurses to do without one in the hospital.

Line the foot tub with a rubber sheet leaving the margin of the latter free, put the filled hot-water bags (uncovered) into this and cover them with the free portion of the rubber.

Put one on top of the other in the following order, the bath blanket, rubber and thick blanket,[1] with the blankets extending three inches beyond the rubber at one end. Fold or roll these together and take them with the remainder of the equipment (*i. e.*, 7–12) to the bedside.

Replace the upper covers with a bath blanket in the usual manner, folding down the former to the foot of the bed.

Pass the blankets with the rubber between them under the patient in the same manner as the under sheet when making a bed. Before drawing the patient on to them arrange their position so that the upper edge of the rubber will be on a line with her neck and that of the blankets three inches higher.

Take off the nightgown.

Envelop the patient in a thin bath blanket.

Put the dressing towel between the upper edge of the covering blankets and the patient's neck.

Draw up the covers.

Place the ice-cap on the head.

Go to the bathroom. Take the temperature of the water in the bath tub. This should now be between 150° and 160° F. If you have been so long doing your

[1] Some physicians prefer having the wet blankets put in contact with the skin, when this is the case, this blanket is omitted.

work that the temperature is lower than this, add more hot water.

With the help of an assistant, wring the blankets, do the one fanfolded crosswise last. To do this, each take a dry corner and twist in opposite directions. Wring the blankets as dry as possible and work quickly, when you finish each blanket, put it into the foot tub with the hot-water bottles and cover them with the margin of the rubber. Have the blanket that is folded lengthwise on top as it will be needed first.

Carry the tub with its contents closely covered to the patient.

Fold the bed covers to the foot of the bed.

Remove the ice-cap.

Turn the patient on her side.

Under cover of one side of the bath blanket that is over the patient, spread the lengthwise folded blanket (keeping it doubled) on the bed where the patient will lie on it. Turn the patient on to it.

Put the ice-cap on her head.

Under cover of the upper bath blanket, put the other wet blanket over the patient, leaving the one in which she is enveloped in place, press both the enveloping blanket and the wet blanket down between the arms and the legs and tuck the ends of the wet blankets snugly around the body.

(*If the wet blankets are put next the skin test their temperature on your arm before putting them in place and it is especially important that in the preparation of the blankets as much water as possible be wrung from them.*)

Turn the sides of the bath blanket that is covering the patient over her and bring up the sides of the upper dry blanket and fold these across her shoulders and over her body as you did the blanket in Demonstration

44, Method 2, being very careful to draw them snugly around the neck and feet.

Put the covers on the hot-water bags and place them one at the feet and two along each side.

Bring the sides of the rubber up over the patient and fold the under blanket around her.

Arrange the towel between the blankets and the patient's neck.

Feel the pulse at the temporal or facial artery and do this frequently during the pack.

Draw up the bed covers.

If possible have an assistant when putting a patient in a hot pack as it should be done quickly.

The rules regarding the giving of drinks are the same as for the bath pack.

A patient is never to be left alone while in a pack. If she is in a ward and in good condition, it may not be necessary to remain at the bedside, but you must arrange the screens so that you can watch her and never go so far away that you will not hear if she speaks to you.

If the patient remains in good condition the pack is usually continued for twenty minutes.

When the time is over, turn down the bed covers, remove the hot-water bottles, the upper wet blanket, the rubber, the blanket covering this, and the wet blanket under the patient. To remove the last three articles turn the patient on her side, roll the blankets and rubber to her back, dry her back, turn her over on to the dry blanket (which was under the rubber) and remove the roll. Keep the upper bath blanket over her while you are doing this.

Dry the patient thoroughly, bring up the edges of the under blanket and fold them around her under cover

of the other blanket. Remove the latter and at the same time draw up the covers. Replace the ice-cap on her head.

Leave the patient thus for about an hour, then, dry her thoroughly, rub her with alcohol, and replace her night-gown. To do this, bring a dry bath blanket, replace the covers with this and work under it. When you have finished, remove this blanket at the same time as you draw up the covers.

Method 2

Requisites.—These are the same as the equipment for Method 1 except that wool blankets are substituted for all the cotton bath blankets except those that are wet and three are required for the latter purpose.

Procedure.—This is almost the same as for Method 1 except the preparation of the wet blankets which is as follows: The three bath blankets are soaked in warm water and then wrung dry, one of these is then doubled and fanfolded lengthwise and placed in the tray of the utensil sterilizer, the other two are fanfolded crosswise and likewise placed in the tray. There should not be more than about 2 inches of boiling water in the sterilizer, as the blankets are to be steamed only and must not touch the water. If necessary, inverted basins can be put in the sterilizer to keep the blankets out of the water. Have the sterilizer tightly closed so that all the steam will be kept in and allow the blankets to remain for from 20 to 30 minutes. Then envelop them in the warmed rubber lining the foot tub and carry them to the bedside.

The doubled, lengthwise folded blanket is put under the patient in the same manner as in Method 1 and the other two are put over the patient as in Method 1.

Demonstration 47

Local Hot Pack

In the treatment of stiff joints local hot packs are very often used when electric and vapor baths cannot be obtained.

Equipment.—1. A pillow witn a rubber under the white case.

2. A piece of rubber sheeting large enough to envelop the part that is to be treated and two hot-water bags.

3. Two pieces of bath blanket or flannel somewhat smaller than the rubber and one slightly larger.

4. Two hot-water bottles, covered.

5. A basin of water about 190° F.

6. A crash towel.

Procedure.—Put one of the smaller pieces of blanket in the crash towel and submerge this, except the two ends, in the water.

On the pillow, place (1) the larger piece of blanket, (2) the rubber, (3) two small pieces of blanket.

Draw the pillow with its covers into position, lifting the limb, if it is painful, as described in Demonstration 20.

Wring the water from the wet blanket by twisting the ends of the towel in opposite directions and get it as dry as possible, and do not have it hotter than you can bear on your own hand.

Put this a ound the affected part with the opening underneath. Bring the dry blanket over it. Place a hot-water bag on either side. Bring up the rubber and then envelop the whole in the under blanket fitting this as snugly as possible without causing pain.

When, as is often the case, this treatment is continued

for an hour or more, the wet compress must be changed about every half hour. In such case an extra piece of flannel or blanket will be needed as the compress in use is not to be removed until the fresh one is ready.

Supply freshly filled hot-water bags with every other change of compress, *i. e.*, every hour.

Demonstration 48

Vapor Baths

Various types of cabinets are generally used for the modified Russian or vapor baths given in hospitals.

The kind of cabinet very commonly used is one which surrounds the patient when she is seated within it. The steam either enters through pipes or is generated by boiling water on, preferably, an electric stove within the cabinet.

Equipment.[1]—1. The bath cabinet and, if there is no base to it, a heavy rubber to protect the floor, unless this will not be injured by moisture.

2. A bath thermometer.
3. The apparatus for generating heat.
4. A chair, unless there is one in the cabinet. An old wooden one is best, metal being likely to become too hot.
5. An ice-cap.
6. Two bath blankets.
7. A rubber sheet.
8. A face towel.

[1] When the cabinet is not in the same room as the bed there will be needed, in addition to the articles required for demonstration, a stretcher or wheel-chair and a thick blanket or two to cover the patient during transportation.

9. A bath towel.
10. Slippers.

Procedure.—Arrange the cabinet. Two important points to be considered in doing this are: That the apparatus for generating vapor must be so placed that a stream of steam will not flow directly upon the patient and, if the heating apparatus is within the cabinet it is to be fixed where there will be no danger of its being overturned or setting fire to anything. The best place to put it will depend upon the shape and size of the cabinet. A good arrangement with small cabinets is to put a heater and basin of boiling water in a foot tub and place this somewhat under the chair, but far enough to the back to prevent the steam coming against the patient's legs.

Undress the patient, if she is not in bed, wrap a bath blanket loosely around her. Put on her slippers.

When the patient is in position in the cabinet, if the heating apparatus is under the chair, see that her legs are well protected with the blanket. Close the cabinet and place the ice-cap on the patient's head.

Arrange the bed. Fold the upper covers to the foot of the bed and cover the bedding with the rubber sheet and this with a bath blanket.

When the time for the bath is over, usually twenty minutes, turn off the heat. Dry the patient quickly, under the blanket, let her remain seated while you do so.

Help her into bed, turn the blanket so that the opening will be in the back while you do so. Remove her slippers. Wrap her in the blanket that is on the bed, under the one surrounding her, and then remove the latter. Draw up the bed covers. Put the ice-cap on her head.

The treatment during and after the bath is the same as for the wet pack.

Demonstration 49

Hot-Air Bath in Bed

The details of the procedure in giving hot-air baths depends considerably on the nature of the appliances provided for the purpose; however **the aims** in all methods are to arrange the apparatus in such fashion that there will be no escape or entrance of air and to obviate all danger of burning the patient. The description given here calls for a simple box-like cabinet which fits over the patient when she is lying on the bed or else the substitutes specified.

Equipment.—1. A rubber sheet, this should be large enough to envelop the cabinet and it should be brought to the bedside covered with a blanket which should extend about six inches beyond the rubber at the top. These should be rolled or folded ready to put under the patient as in Demonstration 46.[1]

2. A bath blanket (in addition to that with the rubber).
3. Safety pins.
4. A long chemical thermometer.
5. An ice-cap.
6. A bath towel.
7. A face towel.
8. Pipe for conducting the hot air and, if necessary, a stand or support.

[1] The reason for arranging these articles before bringing them to the bedside is that in a ward, there is seldom a table large enough to spread them out on while putting them together and unless this is done properly it is hard to get them smooth, and if they are placed on the bed separately, as is sometimes done, it is difficult to get the roll or fold small enough to bring the patient over it easily when turning her back on to the portion of the bed that you have covered.

9. Bunsen burner or whatever appliance is used for generating the heat.

10. Cabinet or substitute, viz.: (a) one or more cradles, the number required will depend upon their size, they should extend from the foot of the bed to about over the patient's shoulders; (b) two blankets; (c) two rubber sheets; (d) a piece of asbestos to put between the stovepipe and the blankets.

11. If liquids are not prohibited, a tray with the desired beverage, glass, and drinking tube.

Procedure.—Count and record the pulse. Replace the bed covers with a bath blanket as described in Chapter V.; remove the covers from the bed and hang them over a chair or screen.

Put the rubber and blankets under the patient in the usual manner, see page 292, and have them extend up over the pillows, how far, will depend upon the nature of the cabinet or substitute used; they must be high enough to fold over the patient's neck and shoulders and reach considerably above the rim of the cabinet or cradle so as to prevent air leaving or entering the bath.

Remove the nightgown.

Put the face towel between the blanket and the patient's neck.

Place the ice-cap on her head.

Put the cabinet in position or, if there is no cabinet, the cradles and, over the latter, put the two blankets allowing these to lap about two inches and one to extend over the cradle at the foot and the other at the top sufficiently for the lower one to be tucked under the cradle at the foot and the other under the patient's shoulders. Put the rubbers over the blankets, and both rubbers and blankets under the cradles along the sides

and foot and under the patient's shoulders at the top. Arrange an aperture either at the foot of the bed or at the side, where the blankets and rubbers meet, in which to introduce the pipe.[1]

Bring the sides of the blanket and rubber that you put under the patient up over the cabinet or covered cradles lapping them across the chest. Pin the blanket, if necessary, to keep it in place.

Insert the thermometer. Cabinets are provided with a hole and holder for the purpose. If cradles are used, tie the thermometer to the lower cradle, near the foot, putting it where the blankets and rubbers lap; allow the top to project from at least slightly below the mark of the bath temperature, and do not allow the lower portion to be in the patient's way. Pin the blankets firmly around the thermometer.

Put the pipe in place. If cradles are used, cover the part that will come in contact with the rubbers and blankets with asbestos unless, as is sometimes the case, the pipe is permanently covered with this material. Cabinets, as a rule, have metal or other non-inflammable material at this point, of course, if the one used has not, it must be protected from an uncovered pipe.

Adjust and light the heating apparatus.

Spread the bedclothes neatly over as much of the cabinet, etc., as possible, without interfering with the thermometer.

The temperature prescribed for a hot-air bath is usually between 120° and 160° F. and the duration is usually fifteen or twenty minutes from the time the

[1] Unless the patient is small or the bed wide, it is usually better to put the pipe at the foot of the bed as there will be more space there between the patient's body and the incoming air.

temperature reaches the prescribed degree, provided the patient shows no ill effects.

The same precautions and care are necessary during the bath as for the packs.

When the bath time is over, remove the source of heat, but allow the patient to remain undisturbed for about thirty minutes, then remove the cabinet or its substitute and, under cover of the bath blanket rub the patient with alcohol, remove the rubber and blanket under her, put on her nightgown, draw up the covers, and at the same time, remove the bath blanket.

Continuous Hot-Air Baths

Aims.—Continuous hot-air baths are often used in the so-called *open treatment* of burns in order to: (1) promote a general stimulation; (2) keep the skin active; (3) prevent irritation of the wound by dressing and exposure to changes of temperature.

One very essential difference in a bath that is to be maintained indefinitely and one of short duration is the temperature. This, for a continuous bath, must not be high enough to interfere with heat elimination and, therefore, must be somewhat below body temperature; 90° F. is a degree that is frequently prescribed.

A common method of arranging such a bath is as follows:

Cover the mattress with a large rubber and this with one (or more if thin) old blanket, and these with a muslin sheet; it is most essential to stretch these covers tightly before tucking them under the mattress and to tuck them far enough under the mattress to keep them absolutely free from wrinkles. If there are burns on the under surface of the patient's body a

folded sterile sheet is usually placed where they come in contact with the bed.

Over the patient place cradles, as described on the preceding page, and over these drape two sheets (one covering the top and the other the foot of the cradle, and overlapping each other in the center), or thin dimity spreads.[1] Arrange the thermometer and the heating apparatus in place as in Demonstration 49. The burns are left exposed, without dressing or covering other than that over the cradle.

An ice-cap is usually kept on the head and the patient given frequent drinks, so that the kidneys will be kept active and the toxic substances absorbed from the suppurâting lesions be highly diluted during their excretion and their power to injure the kidneys, through which they are excreted, thus minimized.

Demonstration 50

Local Hot-Air Baths

A very common form of treatment for stiff joints is to expose them to a high temperature (200° to 300° F.), for about twenty minutes daily, and to follow this by massage. The benefits that can be derived from heat under such circumstances have been already discussed, see page 284.

The cabinets used for this treatment vary in size and shape according to the part for which they are to be used. They are usually made of metal and lined with asbestos, for the latter does not absorb nor part with heat

[1] Sometimes it is necessary to have additional covers over the cradle in order to maintain the desired degree of temperature, but it is better not to have them unless absolutely necessary, for without them, the air over the wounds is kept purer.

as readily as metal and, therefore, will not scorch nor set fire to the material protecting the body as quickly as metal will. The modern cabinets are heated by electricity or electric lights.

Equipment.—1. A cabinet.

2. Protectors. These are usually made of two to four (according to the thickness of the material) layers of either flannel, old blanket, wadding stitched between gauze, or Canton flannel. Those made to fit the part loosely—*e. g.*, mitten and sleeve-shape for the hand and arm, stocking-shape for the leg and thigh, are better than those that were wrapped about the part because they can be adjusted with less delay and movement and should, through carelessness, the protector take fire the limb can be withdrawn more quickly.

The more essential points to be considered in giving this treatment are as follows:

1. The patient must be comfortable during the treatment, therefore, arrange the height and position of the cabinet so that she can lean back comfortably in her chair during the treatment and make sure that there is absolutely no strain on the muscles of the part that is being treated.

2. If the patient has on a ring or rings remove it or them, *even a wedding ring*, for metal absorbs and parts with heat so rapidly that a ring may become hot enough to burn the flesh.

3. Dry the part that is to be treated.

4. Envelop the part in a protector, because even asbestos will become hot enough to burn the flesh if the surrounding temperature is 200° F. while the materials used for protectors do not.[1]

[1] For reasons, see Physics, under the specific heat and relative heat of substances.

5. Never put pins in a protector because, for the reasons given under precaution 2, they may set fire to the latter.

6. Before putting the part to be treated in the cabinet make sure that the asbestos is in place and intact. Protectors have been set on fire by exposed screw heads and areas of metal.

It must be appreciated that a temperature of 300° F., and even 250° F., is exceedingly near the kindling temperature of materials that will serve for protectors.

7. Look at the thermometer every few minutes.

8. Never, under any circumstance, leave a patient alone during a treatment.

As a rule in the local bath there is not enough of the body exposed to the high temperature to produce pronounced systemic symptoms, but if a patient is affected arrange the bath so that she can lie down during the treatment or, if this is impossible, lean forward and rest her head on a pillow placed on a table. If a bath induces a headache put an ice-cap on the head during future treatments.

The Sitz Bath

The sitz tub, in which this form of bath is given, is so fashioned that a person can sit with her feet on the floor, the upper portion of her thighs and her abdomen immersed in water, and her back resting against that of the tub.

The purpose of this treatment is to relieve congestion of pelvic organs. This it does by relaxing the muscles and the superficial blood-vessels of the parts exposed to the heat, a condition that, as explained in the section on the action of heat, favors an excess amount of blood and its consequent withdrawal from congested areas.

Procedure.—See that the bathroom is warm (about 80° F.) and fill the tub to from one-half to two-thirds its capacity (depending upon the size of the patient) of water the required temperature. This is usually 110° or 115° F.

Clothe the patient in an undershirt, folded above her waist line, stockings, and slippers, and pin a bath blanket around her neck with the opening in the back. Fold a towel over the upper edge of the blanket where it is in contact with her neck.

The first time the patient has the treatment tell her that the water is hot, but that it cannot burn her.

Hold the blanket so that it will not get wet while the patient seats herself in the tub and then arrange it enveloping her and tub.

Usually, an ice-cap is not required, but use one if the treatment gives the patient a headache.

If it is necessary to raise the temperature of the water during the bath, keep your hand between the patient and the inflowing stream.

Put a chair where the patient can sit down as soon as she steps from the tub at the completion of the treatment, which is as a rule, in twenty minutes. Dry her, keeping the blanket around her while you do so.

If the patient is not confined to bed, it is best to give this treatment just before she retires for the night, but, if this is not possible, caution the patient to remain as quiet as possible for some hours, as otherwise, she may not reap the full benefit of the treatment.

Demonstration 51

The Foot Bath

The common therapeutic purposes of this treatment are: (1) To relieve congestion in distant organs as the

throat in tonsillitis, the lungs in pneumonia, the pelvic organs in dysmenorrhea; (2) to relieve local congestion and stiffness such as exist when the ankle is sprained.

The relief of congestion in distant organs is brought about by reflexes (*explained in Chapter XVI, under the effects of counterirritation*) and by the increased amount of blood that accumulates in the blood-vessels of the parts immersed in water when these vessels become dilated under the influence of the heat; naturally when extra blood is diverted to these vessels there is less in those in others parts, including the congested ones.

Equipment.—1. A foot tub half full of water, usually 110° or 115° F.

2. A bath blanket.
3. A bath towel.
4. A face towel.
5. A covered hot-water bag.
6. A bath thermometer.

Procedure when the patient is in bed.—Loosen the upper bed covers at the foot of the bed.

Double the bath blanket lengthwise and then fold it in four with the two ends on one side of the central fold.

Place this across the foot of the bed, under the loosened covers with the ends toward the foot. Standing near the foot of the bed, take the upper one of these between your third and fourth fingers and the bed covers between your other fingers and thumbs and turn the covers back to above the knees, carrying a portion of the blanket over the legs at the same time.

Flex the patient's knees.

Turn back the lower portion of the blanket so that it will cover the part of the bed on which the tub is to rest.

Place the tub on the bed, near the feet, over the lower fold of blanket.

Put your arm that is nearest the head of the bed under the patient's legs and your hand under her heels.

Fig. 35. Foot bath. The blanket has been drawn up to show the manner of holding the feet while putting them into the tub, ordinarily they should not be exposed.

Put your other arm across the tub, grasping it on the far side, and move it forward into position while, at the same time, you raise the feet and legs from the bed. This is done under the top layer of blanket, the arm being kept across the tub to prevent the blanket getting into the water.

Before lowering the feet into the water, tell the patient that it is hot, but that it cannot possibly burn her. Put the feet in slowly and, if the patient objects to the heat, raise and lower them alternately for a short time until she becomes accustomed to it.

Put the edge of a folded towel between the legs and the rim of tub; be sure that it is not near the water.

Take hold of the upper edge of the blanket and hold

it in position, while with your other hand you draw down the covers.

Roll the hot-water bag in the bath-towel (to warm the latter) and place it under the covers.

The feet are kept in the water for from twenty to thirty minutes. If it is necessary to raise the temperature of the water, bring some water that is about 150° F., in a pitcher and pour it in slowly, keeping your hand between the patient's legs and the stream. This can be done without uncovering the tub except at the point where you are pouring in the water.

To remove the tub.—Turn the bed covers back above the knees, but leave the blanket covering the legs. Take the bath towel from the hot-water bag and place it on the far side of the tub. Take the towel from behind the patient's legs.

Put your arm under the legs as when putting them into the tub, raise them from the water and hold them over the tub for a few seconds, that the water may drain from them, then put one side of the layer of blanket that is covering them around them and lower the feet on the bath towel.

Remove the tub. Dry the feet and then remove the blanket from underneath them.

Put the hot-water bag at the feet.

Draw down the covers and, with them, the blanket. Remove the latter and tuck the covers under the mattress as usual.

Procedure when the patient is not in bed:

Provide a comfortable chair and over the outer edge of the seat and the floor spread a heavy colored blanket.

Have the patient sit on the chair, remove her shoes and stockings and turn her skirts up above her knees.

Put the tub in position, place the patient's feet in the water and envelop her legs and the tub with the blanket.

Warm or Sedative Baths

Purposes.—Warm baths are used in therapeutics: (1) As sedatives for the central nervous system in the treatment of the excitement of mania, insomnia, and nervous exhaustion, and as a preventative of nerve fag during periods in which an individual is subjected to nervous strain from any cause. (2) As peripheral sedatives in the treatment of certain skin diseases and of extensive burns.

Anatomical and physiological conditions upon which the action of warm baths depend.—Directly under the epidermis, are innumerable nerve endings which are stimulated in different ways, *e. g.*, some are stimulated by heat, others by cold, others by pressure, others by touch; therefore such things as exposure to temperature much higher or lower than that of the skin, currents of air, pressure of clothes, and movements of the muscles result in a constant inflow of impulses from the periphery to nerve centers in the cord and brain. Also, impulses are, while the individual is awake, incessantly passing to the brain from the eyes and ears. As the result of these afferent impulses, there is a constant stimulation of nerve centers and a continuous discharge of efferent impulses to the muscles.

On the contrary, if a person lies comfortably in a bath that is about the same temperature as the skin, in a quiet, dark, or dimly lighted room, peripheral stimulation is reduced to a minimum and, consequently, the stimulation of nerve centers. As a result of this the muscles become more or less relaxed. The relaxed

condition of the muscles and the lessened stimulation of the vasoconstrictor centers result in an increase in the amount of blood in the extremities and the eventual diminution of that in the brain, a condition which inhibits mental activity and favors rest and, as the result of rest, provided the anemia is not excessive, recuperation of nerve centers.

A bad effect that, unless some means is taken to prevent it, may follow the daily use of warm baths is an increased susceptibility to *taking cold;* this, however, can be prevented by taking the warm bath at night and a cold one in the morning. The latter would probably be counterindicated in the skin diseases for which a sedative bath is used and, of course, it is not used for a burned person.

The temperature of a bath used for sedative purposes is, usually, about 96° F., the desideratum being to have it near enough the skin temperature not to arouse stimuli and vet not hot enough to prevent heat elimination.

The duration of a sedative bath varies from about one-half hour to several hours, or, in the treatment of burns, it is practically continuous, the patient, as a rule, being removed only when necessary for evacuation of the bowels and bladder and for treatments.

Points to be considered in the giving of this treatment are: (1) The patient must be as comfortable as possible and all strain prevented (such as, for example, will be induced if she has nothing to brace her feet against when they do not reach the foot of the tub). (2) The temperature of the water must be maintained. (3) If the patient is physically strong the water should be deep enough to reach the neck, but, for a debilitated patient, it should only come to the nipples. (4) If the bath is used

as a nerve sedative, quiet is essential and the room must be dark or only dimly lighted and (5) the patient is to be dried quickly and, when the treatment is used for insomnia, to go to bed immediately.

Means to secure comfort beyond, when necessary, putting something for the patient to brace her feet against, are only required when the patient is physically exhausted or when the bath is to be continued for a considerable time. In either of these cases a support for the head and shoulders is generally desirable. This usually consists of a band of canvas or of two layers of flannelette about twenty-seven inches wide, which is fastened across the top of the tub, being stretched fairly tight where the head rests and allowed to sag under the shoulders sufficiently to allow the chest to be submerged in the water; the difference in the tension of the support must be gradual so that it will provide a comfortably slanting support for the back. In hydrotherapy departments, tubs used for these purposes are usually provided with hooks or bars to which such supports can be fastened. A good substitute on an ordinary tub is to tie a cord around it under its rolling edge; this will prevent it sliding up, and, to hinder the cord from falling, tie it to the base ot the faucet, and, at the top, pin the upper and side edges of the support around it with strong safety pins. A rubber air ring or cushion is, as a rule, needed under the head.

When the bath is to be continued for several hours it is sometimes well to put a folded bath blanket along the bottom of the tub, for the patient to lie on.

To keep the water warm when the bath is to be continued for any length of time (1) cover the tub. A doubled blanket is best used for this purpose and, to keep it out of the water, two or three slats of wood can be

placed under it, across the tub, or, if these cannot be obtained, pin it to the bars of the tub or to their substitute *i. e.*, the cord around the tub. For a continuous bath, place a rubber sheet over the blankets and, in order to attain a neat appearance, drape a sheet or dimity spread over this and around the tub. (2) Add hot water when necessary. In doing this keep your hand between the patient and incoming stream, and occasionally stop the flow and mix the water by stirring your hand through it. While doing this, when the bath is used as a central nerve sedative disturb the patient as little as possible and avoid conversation.

In the treatment of burns a hammock, such as is used in the Brandt bath, is provided for the patient to lie on so as to facilitate the lifting from and to the bath when necessary to remove her for treatments, etc.

Twice a day while the patient is out of the bath scour it thoroughly.

As a rule, when the bath is used for this purpose, boric acid sufficient to make a one per cent. solution is added to the water—see page 315—and the patient's skin is smeared with vaseline or ointment in order to prevent its excessive maceration.

Medicated Baths

Under this heading may be classed all baths to which drugs of any kind have been added.

The most common uses of such baths are:

1. To alleviate skin affections. The medicament used for this purpose is generally either an antiseptic, as boric acid; a parasiticide, as sulphur; a bland substance to allay irritation, as bran; or one that will allay itching, as sodium bicarbonate.

2. To, by chiefly stimulating sensory nerve endings in the skin, promote a general stimulation of the nervous system and thereby improve the circulation, increase the amount of blood in the derma and muscles and thus relieve congestion of the viscera. Under this heading may be classed mustard and the various salts used for baths such as the imitation Nauheim and Carlsbad salts.

The temperature of medicated baths depends upon their purpose: Those used to allay skin irritation, naturally, are of a temperature that will have a sedative effect—about 96° F. The stimulant baths, on the contrary, with the exception of mustard, are colder—*i. e.*, between 85° and 65° F. The temperature of mustard baths depends upon whether a counterirritation due solely to mustard (see page 493) is wanted or whether the effects of heat are also desired. In the former case, the temperature of the bath is usually between 96° and 100° F. for, if the water is hotter than this, the strength of the mustard will be diminished (the reason for this is explained in Chapter XVI.), but mustard is sometimes added to baths of about 105° to 112° F., with the expectation of inducing a slight irritation which will augment the effects of heat in relieving internal congestion.

The method of giving medicated baths depends upon their purpose and temperature. Baths below 75° F. are given as described under cold baths; those between 90° and 100° F., as described under sedative baths; and those above 100° F., as described under hot baths. When baths are given to allay skin irritation, the patient is dried by wrapping her in a warmed sheet and gently patting over this—*an irritated skin is not rubbed*. After a stimulant bath, on the contrary, a brisk rubbing is usually indicated, the reasons for this have been already discussed.

The methods of preparing, and the amounts of medicament to use, for the baths mentioned at the beginning of this section are as follows:

The bath tub is filled to, depending upon the size of the patient, ½ to ¾ its capacity. An ordinary sized tub—about five feet—holds approximately, when half filled, twenty-five gallons—*i. e.*, one hundred quarts.

For a boric acid bath, dissolve the boric acid powder (using one ounce for each gallon of water) in some of the bath water and add the resulting solution to the remainder of the water. This proportion will make, approximately, a one per cent. solution.

Prepare a **sodium bicarbonate** bath in the same manner as the boric acid, the strength commonly used is about eight ounces of soda to every gallon of water.

For a **bran bath** put between two and three pounds of bran in a bag made of doubled cheesecloth and immerse this in the hot-bath water. Let it remain in the water, moving it around from time to time until the water is of a milky color and the required temperature.

For a **sulphur bath** dissolve from one to two ounces of sulphurated potash (known also as liver of sulphur) in hot water and add this to the bath water.

Mustard baths are used chiefly in the treatment of children in convulsions or as foot baths. The mustard is to be either made into a smooth paste with cold water before being added to the bath water or else tied in gauze and this moved about in the bath water until the mustard is dissolved. The object being to avoid having lumps of mustard undissolved in the water as these are likely to adhere to the patient's skin and cause blisters. If the temperature of the water is below 105° F. use one tablespoonful of mustard for every gallon of water, if the temperature is higher

than this use somewhat more mustard, about one and a quarter tablespoonfuls for children and, for adults, from this amount to two tablespoonfuls (depending upon the temperature of the water and the apparent degree of delicacy of the patient's skin).

For **sea salt** baths dissolve about ten pounds of the salt in a tub half full of water.

The amounts of the special salts (as the artificial Nauheim) and the method of preparing them for use are stated on the packages in which the salts are bought and as these vary considerably it is hardly worth while giving directions here. Some preparations of this kind will destroy the pipes ordinarily used in house plumbing and, therefore, can be used only in places where special pipes have been installed.

Light Baths

The use of light in the treatment of disease is known as *heliotherapy*.

Before considering the therapeutics of light, it will be well to recall a few facts regarding what is known as *the ether*, for, as a rule, other ether forces, in addition to its manifestation known as *light* are made use of in heliotherapy.

It will be remembered that in order to account for the transmission of the sun's light and heat through space and certain other phenomena of nature, scientists have concluded that there must be a tenuous, though invisible, medium, that they have called *the ether*, permeating space and that this, by means of the molecular motion known as *heat*, is thrown into a wave-like movement that has a velocity of 186,000 miles per second. These waves, when produced by very hot bodies, like the sun, are of exceedingly different lengths, some of them

being miles long and others only the fraction of a millimeter.

These waves, generated by heat, will, though not hot themselves, beget heat in matter upon which they impinge, because they increase molecular motion in matter upon which they strike and heat is molecular motion. In addition to their heating effects, the longest waves are capable of producing electrical phenomena and are therefore known as *electrical waves* (*it is these waves that are made use of in wireless telegraphy*); some of the waves shorter than the electrical waves, as far as known, give rise only to heat and are thus called *heat waves;* waves between .0007 and .0004 of a millimeter stimulate the optic nerve and are known as *light waves;* and still shorter ones than these induce chemical reaction in various substances and are consequently known as actinic or chemical rays. Also they are called ultra-violet rays because they are shorter than the shortest of the light rays and these when separated from light waves of other lengths, give rise to a sensation of violet when they stimulate the optic nerve and are therefore said to be of a violet color.[1] It is only, it will be remembered, when light waves of all lengths are present together that we have the usual sunlight hue, for it has been found that when the light waves of different lengths are separated those

.0007	mm.	are	red
.0006	"	"	orange
.00058	"	"	yellow
.00053	"	"	green
.00047	"	"	blue
.0004	"	"	violet

[1] Students who have not studied physics should read the sections on the nature of light, color, and heat in a textbook of physics.

Another point that it is essential to recall in order to understand some procedures in the use of light in therapeutics is that ether waves may be absorbed by matter or be reflected from it, or they may pass through it, but those of different lengths pass with different degrees of facility through dissimilar substances. Coloring matter is a very potent factor in determining the degree of absorption, reflection, or passage of ether waves, were this not so dyes would not produce different colors. This property of pigment is of value in heliotherapy because colored glass can be put between the patient and the light when it is desired to exclude certain rays; for red glass allows free passage of heat waves, but inhibits the passage of chemical rays[1] and, though to a less extent, light rays; yellow and green glass allow only light waves to pass readily, but do not shut out either heat or actinic rays entirely; blue and violet give freest passage to the short chemical rays and shut out the heat rays. However, even chemical rays will induce molecular motion and, consequently, heat in matter upon which they strike, though, as their heating effect is so much less than that of the longer rays they are sometimes spoken of as the *cold waves*. To repeat, when light is credited with the stimulant effects obtained in heliotherapy, just as when it it claimed to be the source of energy promoting the growth of plants, the term is used, not in its restricted sense but to represent the different forms of vital energy that heat sets in motion in the ether.

Electric lights, for obvious reasons, are made use of to a greater extent than sunlight in heliotherapy. That these will, though, of course, to a much lesser degree,

[1] What is known as *sunburn* is not in reality a burn, but a form of erythema due to the chemical rays. In some treatments, however, these rays are thought to be the most essential ones.

produce similar forms of energy to the sunlight is shown by the fact that the growth of plants can be hastened by subjecting them to the influence of powerful electric lights during the night. It is, however, only by the use of special devices such as what is known as the *quartz burner*, which is used in an apparatus called the *Alpine Sun Lamp*, that any amount of chemical rays can be secured for therapeutic purposes with electric lamps.

The purposes for which electric light baths are used in therapeutics are: (1) The effects of heat; (2) the stimulation of nutrition, which is promoted by the increased molecular motion induced by the rays striking upon the body; (3) the promotion of tissue growth in open wounds; (4) the disinfection of wounds.

The details of procedure depend upon the nature of the apparatus available, the patient's condition and whether or not diaphoresis is to be induced.

The appliance commonly used for giving general electric-light baths is some form of box-like cabinet which surrounds the body, except the head, and is supplied with electric lights. In some types the patient sits and in others lies nude, exposed to the rays. A bath blanket, which is put around the patient when she is undressed, is spread out over the chair or, if the patient is recumbent, the floor of the cabinet and, at the conclusion of the bath, before the door is opened, the patient draws this around herself or, if she is unable to do so, the nurse, opening the door to the slightest necessary extent, does so for her.

There are also cabinets, which can be put over the patient on a bed, that are similar to those used for giving hot-air baths in bed, with the exception that they are supplied with electric bulbs, instead of an opening for the admission of hot air. Also a cabinet can be improvised by using the same substitutes as for the hot-

air bath, excepting the heating apparatus and shields, and in lieu of these, a string of electric lights, such as is used for lighting Christmas trees, but of somewhat higher power, can be used and, in order to throw the rays upon the body, metal reflectors should be placed over the lights; these can be the ordinary reflectors used over electric light bulbs or pieces of tin or zinc bent over the cradle above the lights.

When the bath is given to promote diaphoresis, if a stationary cabinet is used, the patient, after leaving it, lies on a bed or cot that has been prepared as for the bath pack and receives similar treatment. If the bath is given in bed the treatment during and after the bath is the same as for the hot-air bath in bed with the following exceptions:

(1) Remove the blanket covering the patient. This need not necessarily be taken from the bed, in fact it is better, after covering the cradles or getting the cabinet in position, to put your hand under and draw the blanket to one side, for you will then be able to cover the patient with less exposure when the time comes to remove the cabinet, etc. The reason for uncovering the patient is to expose the body to the rays produced by the heat of the lamps.

(2) As high a temperature is not prescribed, as a rule, for a light as for a hot-air bath, because, in the former, the body temperature is likely to be increased by the molecular motion that is caused by the rays striking upon the body[1] as well as by the inhibition

[1] People who have ascended to the summit of high mountains, where, as the air is rarefied and contains little moisture and there is dearth of vegetation, there is little to shield them from the direct rays of the sun, have suffered intensely from the heat produced within their bodies by the impinging rays, even when the surrounding air was intensely cold and the ground was covered with snow.

of heat elimination and other conditions caused by the heated air. Temperatures very commonly prescribed are between 100° and 120° F.

When the bath is given for other purposes than to produce sweating means are taken to prevent any avoidable rise of the temperature of the air surrounding the body, and, therefore, there are the following differences in procedure:

1. Do not bring the blankets, etc., that are under the patient up over the cabinet nor cover it and, if cradles are used, cover these only with sheets as described on page 303.

2. The duration of such a bath is generally from one half to one hour.

3. When the bath is over, rub the patient at once with alcohol, keeping the bath blanket[1] over her as you do so, and then remove (1) the blanket, etc., protecting the bed and (2) the blanket covering the patient, drawing up the bed covers at the same time in the usual manner.

Even when the treatment is given in this manner keep an ice-cap on the patient's head and, unless contra-indicated, give about two ounces of water every fifteen or twenty minutes, or oftener if desired, because diaphoresis is increased even though it is not as pronounced as when the surrounding air is heated and, usually, is not apparent, the air being sufficiently heated to hasten evaporation. The fact that the patient is thirsty during and following treatments is proof of the loss of water from the body.

To derive the fullest benefit from such treatments, a patient, even though not confined to bed, should remain quiet for at least an hour after a bath.

[1] A bath blanket is put over the patient in the usual manner before preparing her for the bath, it is moved to one side when the bath covers are in place and drawn over her before they are removed.

Local Electric-Light Baths

Both electric lights and sunlight are now very frequently used in the treatment of indolent ulcers and infected wounds. The cabinets provided for this purpose are used in the same manner as the local hot-air cabinets.

A good and very easily improvised substitute can be arranged as follows:

Put a cradle or a substitute over the part to be treated and from this suspend a light or lights, covered with reflectors, so that the rays will be diverted directly into the wound. Remove all covering, including dressing, from the wound. Cover the cradle with a sterile sheet or sterile towels.

Sun Baths

Equipment.—1. A comfortable cot or couch provided with sufficient pillows to make the patient comfortable.

2. Colored eyeglasses or an eyeshade and, in hot weather, an umbrella.

3. A loin binder and safety pins.

4. A bath blanket.

5. A screen.

Procedure.—Place the couch where the sun will shine directly upon it and put the screen around it. Undress the patient under cover of the bath blanket, pin the binder around her pelvis. Leave the blanket under her with the sides free so that she will feel that she can draw them over her if necessary, as otherwise she is likely to object to lying exposed.

Put on the eyeglasses or shade and, if the day is hot, adjust the umbrella so that it will shield the head; if necessary, tie the umbrella so that it will not be blown out of place.

Take measures to prevent the patient being disturbed.

It is said that to get the greatest possible benefit from sunlight baths, they must be taken on high mountains, under a clear sky, because the vapor in the atmosphere, which is present in largest amounts near sea-level, absorbs the short actinic (ultra-violet) rays and these, in many conditions, are the most important rays.

CHAPTER X

Preparations for Examinations and Treatments and of Excreta that are to be Sent to the Laboratory

Preparation of patients for general physical examinations. Preparation of patients, including the restraint of children, for examinations of the ear, eye, nose, and throat. Positions and preparation of patients for gynecological examinations. Preparation of nurses' hands and the patients' skin for treatments requiring aseptic precautions. Preparation of treatment-trays and emergency treatment-bundles. Preparation of specimens, smears, etc., for examination.

Demonstration 52

Preparation of Patients for General Physical Examinations[1]

Requisites.—1. A shoulder wrap.
2. An ausculating towel.
3. A hand towel.
4. A tape measure.
5. A hand mirror.
6. Tongue depressors (wooden).

[1] A common method of carrying out this and the demonstration following is for a head nurse who knows the methods of the doctors connected with the hospital *to be doctor* and the instructor to demonstrate the nurse's duties. The large and small *demonstration dolls* will answer fairly well for subjects for Demonstrations 52 and 54, but, if possible, it is well to have a child for the procedures in Demonstration 53.

7. A package of small pledgets of gauze (these are sometimes needed to hold out the tongue).

8. A small bag to receive used depressors, etc.[1]

9. A doctor's order book, with a fountain pen or pencil attached.

10. Hot water, etc., for the doctor's hands.

Aims.—To protect the patient from unnecessary discomfort and exposure and to facilitate examination by (1) placing the patient in the correct position, (2) having everything required at hand, (3) anticipating the examiner's movements and requirements.

Important points to remember when preparing patients for physical examinations are:

1. The part to be examined must be exposed as much, but no more, than necessary and, when the patient is in a ward, before starting to prepare her, a screen is to be put around the bed.

2. To work quickly.

3. To be sure that everything required is at hand.

4. For many examinations and treatments the patient's position is of the utmost importance and thus strict attention should be paid to all details taught in this connection.

5. A good light is essential for the illumination of cavities.

6. Quiet surroundings are essential when ausculatory examinations are being made.

Procedure for preparation of patient.—If the patient is conscious tell her something of the reason for the examination and what the physician will want her to do. Unless otherwise directed have her lie flat on her back, with one pillow under her head, ask her to lie perfectly

[1] In some hospitals articles 2 to 8 are kept in an enamel box or basket and taken to the bedside in this.

straight with her arms at rest by her sides, for the doctor usually wishes to see if the contour of both sides of the body is the same.

Loosen the upper bed covers at the foot of the bed.

Turn the lower edge of the spread back under the blankets and arrange them so that they can be quickly folded upward above the knees when the doctor is ready without disturbing the sheet.

Cover the legs and thighs with the sides of the sheet, but have the central portion gathered loosely between these parts.

Unbutton the nightgown and take the patient's arms out of the sleeves, but let the gown remain in place. If it is a closed one make sure that it can be slipped down from the chest easily; if not, take it off and lay it over the chest and arms.

The nurse's duties during an examination are so dependent upon the methods of the physician that no definite rules of procedure can be given, but common requirements are about as follows.

For examination of the chest, while the doctor is using the stethoscope, move the nightgown so as to expose the chest, as much as, and where, he requires it exposed and cover the part as soon as it has been examined. If he wishes to listen to the chest sounds without the stethoscope, move the gown down and at the same time replace it with the ausculating towel; hold a folded hand towel in front of, but away from, the patient's mouth. If the posterior chest is to be examined, cover the anterior portion with the nightgown and either turn the patient as nearly prone as possible or raise her to a sitting position, according to her condition and the physician's wishes. If she is to sit up, button her gown around her neck so that it will remain covering the front of her chest.

and, as soon as you have raised her, draw a pillow down against the lower part of her back, cover the upper portion and the back of her head with the ausculating towel, and put the side that was against the patient previously next to her again, for the physician will not want to put his face against the side that has been next the patient. If the stethoscope is used move the ausculating towel as required.

For examination of the abdomen.—Have the patient lie perfectly straight, with her arms passively by her sides. Leave the nightgown covering the chest and, if the air is cold, put a shoulder wrap over this. Place a towel over the pubes and, when the physician is ready, turn the covers down below the abdomen. It will probably be necessary to flex the patient's knees during the examination and, when doing this, hold the upper edge of the covers so that they will not slip and allow unnecessary exposure.

For examination of the legs, fold up the spread and blankets to the upper part of the thighs. If, as is frequently the case, the physician wishes to compare the legs gather the sides of the sheet which are covering the legs, between them, if he does not, expose only the one that he wishes to inspect.

A cursory inspection of the mouth and throat is generally made in connection with a general physical examination and for this hand the tongue depressor to the examiner on a towel and, at the conclusion of the examination, hold out a paper bag to receive it.

Examination of the chest when the patient is not in bed.—Fold a sheet diagonally and place it around the patient, pin it at the neck in front, leave it loose enough to facilitate moving the opening to the back when required. Remove all clothing from the upper part of the body.

Have the patient sit on a stool or sidewise on a chair so that both the back and front of the chest are accessible. When the physician is ready to examine the front of the chest turn back the corners of the sheet over the shoulders; when he wishes to examine the back, turn the sheet around quickly so that the front of the chest will be covered and the opening will be in the back. Use the ausculating cloth and, during the examination of the front chest, hold the towel between the patient's mouth and the physician's head as previously described.

To prepare a small child for examination of the chest.—Put a crib blanket around the child with the opening at one side. Wrap it securely about the legs, but leave it loose at the top so that the chest can be exposed the minute the physician is ready. If the child is left on the bed or placed on a table hold its hands loosely above its head, but a small child can usually be kept quieter if it is held on the lap for examination of the anterior chest and in the arms for the posterior. For the former purpose, sit opposite the examiner with the child across your knees, its head falling slightly backward. Keep one hand upon the child's legs and, with the other, hold the child's arms above its head. For examination of the posterior chest, stand and hold the child with its chest against yours; have one of your arms across its thighs, just under the buttocks, and, with your free hand, hold its head slightly bent upon your shoulder.

Demonstration 53

Preparation of Patients for Examination of the Ear, Eye, Nose, and Throat

Requisites.—A sheet or blanket with which to restrain a child. A child to act as subject. As many of the

instruments and other appliances used for examinations and treatments of the eyes, nose, and throat as possible.

Aims.—(1) To place the patient in such a position with regard to the examiner and the light that the former will be able to get a good view of the part he wishes to inspect and that the cavity to be examined will be well illuminated; (2) to prevent movements of the patient that would make it difficult for the examiner to do his work and might, were he using instruments, injure the patient. Of course it is only children who are too young to be reasoned with and the insane who are likely to move enough to make actual restraint necessary, but a nurse assisting with an examination that is likely to cause pain, especially if the patient seems nervous, must be on the alert to steady the latter and if necessary, grasp the hands. A very young or obstreperous child or insane person is best restrained by being wrapped in a sheet or blanket, otherwise, securing the arms and legs as described later is sufficient.

Method of illuminating cavities.—The aural, nasal, and throat cavities and the eyes may be illuminated by either direct or indirect lighting. By direct lighting is meant that the light, either natural or artificial, falls directly into the cavity being examined and indirect lighting is that in which a lamp or other source of light is so placed that its rays fall upon a head-mirror worn by the examiner. This consists of a small mirror with a hole in the center through which the examiner can see and a strap that fits around the head to hold the mirror in place. The light rays striking upon the mirror are reflected back into the cavity being inspected. For indirect lighting the source of light is usually placed slightly back of the patient and it must be at a height that will allow the light rays to strike the mirror when the examiner is in position to view the cavity. For

direct lighting a lamp is usually placed just back of the examiner and in such position that the light rays will enter the desired cavity or sometimes a small light, as a flashlight, is used and, in such case, the examiner generally holds it, or has a nurse hold it, near the part being examined; it must be held in such position that it will be out of the examiner's way, but where the rays will illuminate the cavity. When natural light is used for direct lighting the patient is placed with the cavity to be inspected opposite a window.

Procedure when wrapping a child in a sheet[1] for restraint.[2]—Place the sheet cornerwise on one side of the bed, turn back enough of its top corner to obtain a

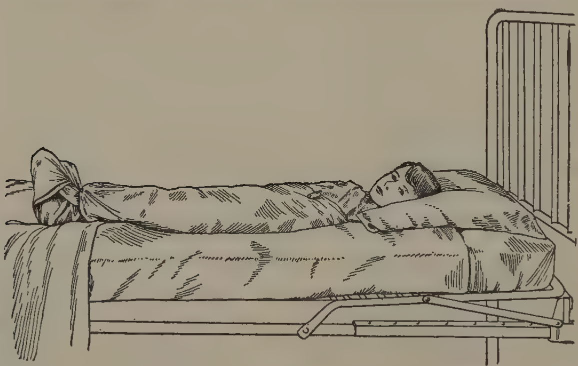

Fig. 36. Restraint of child with sheet.

straight fold sufficiently long to extend around the child's neck and obliquely across its chest. Lift or draw

[1] If the room is at all cold, especially if the child is undressed, a blanket should be used instead of a sheet.

[2] Do not let the child realize that it is being restrained. Give it the impression that the wrapping is for warmth only and, if it is old enough, try to divert its attention by talking about something that it is interested in.

the child to the center of the blanket; have the top fold about two inches above its neck. Turn the bottom corner of the sheet up over the child's legs and tie it. Bring the upper fold around the neck over the shoulders and, obliquely, across the chest (it must fit snugly around the neck); wrap first one side and then the other around the child as tightly as possible without hurting it. As the sides of the sheet are brought forward there will be a fold between them and the portions coming over the shoulders; bring these folds just above the elbows as they will then form a band that will help to keep the child from bending its arms and thus getting them free.

Position of the patient for examination of the ear (otoscopy).—Seat the patient with the ear that is to be examined turned toward the examiner and on a level with the latter's eyes. If reflected light is used, place the lamp just behind the patient, on the right side, a little above the level of the ear and in such position that the light rays will strike the physician's head-mirror. If direct lighting is used place the light so that the rays will fall directly into the ear.

If the patient is a child, hold it on your knee, restrained if necessary, with a sheet, as described page 330, with its legs between yours and one of yours crossed upon the other so as to securely imprison the child's; hold the child's head against your chest with its ear in the position described in the preceding paragraph. Keep your free arm around its body, including its arms.

Position of patient for examination of the eye.—The patient is to sit facing the physician. A child is best held in the lap, restrained if necessary, either as described page 330 or page 332, but a baby is usually wrapped as described page 330 and held in the nurse's lap with its head on the physician's knees.

Position of patient for examination of the nose (rhinoscopy) and throat (laryngoscopy).—The patient sits facing the examiner with the head tilted slightly backward. If a reflected light is used, place the lamp slightly back of the patient, at the right, on a level with the ear, and in position for the rays to strike the physician's head-mirror.

Fig. 37. Method of restraining child.

If the patient is a small child, hold her on your lap, wrapped, if necessary, as described on page 330, with her legs held between yours as in Fig. 37. Hold the child's head tilted slightly backward, against your chest, and, with your free hand, restrain its arms if required; this can be done by passing your free arm in front of one of the child's arms and behind her back and grasping her other arm with your hand as in Fig. 37. Or, according to another method of restraint that is very commonly used, pass your arms under the upper part of the child's and in front of her shoulders and place your hands one on each side of the child's head to hold it tilted slightly backward against your shoulder.

Demonstration 54

Position and Preparation of Patients for Rectal and Gynecological[1] Examinations and Treatments

Requisites.—1. An ordinary sheet and a fenestrated sheet.

[1] Derived from two Greek words signifying a *discourse of women*.

2. Four towels.

3. A Kelly pad[1] and empty pail.

4. A tray containing the articles required for a simple vaginal examination, viz., (a) a rubber glove, (b) a small dressing glass or bowl containing a lubricant (a solution of lysol, about four per cent., is often used for this purpose), (c) a bi-valve[2] and a Sims speculum,[2] (d) a uterine sound,[2] (e) a sponge holder,[2] (f) a small bundle of cotton or gauze sponges, (g) a paper bag to receive soiled sponges.

5. A tray containing articles necessary for simple treatments, viz., the same as for examinations and, in addition, (a) uterine and dressing forceps, (b) tenacula, single and double, (c) scissors, (d) tampons or gauze packing, (e) lotion or disinfectant.

6. Safety pins.

7. A Chase doll.

The procedure of this demonstration can be only imperfectly shown with the demonstration doll, but enough idea of the important points can be gained to make it possible to learn all further technique by careful observation when assisting more experienced nurses with these procedures in the wards, etc. It can be readily appreciated that awkwardness and mistakes in technique during examinations and treatments of this nature are likely to cause much embarrassment and, therefore, it is most important that the essentials be understood, remembered, and always carried out.

The positions commonly used in gynecological examinations are as follow:

[1] In actual practice it is not necessary to provide a Kelly pad and pail when it is known positively that there is to be no treatment given.

[2] These instruments should be sterilized, before and after use, by boiling them for five minutes in soda solution.

1. **The dorsal or supine position,** see page 91.

2. **The dorsal recumbent position** in which the patient lies on her back with one pillow under her head, her knees flexed and separated, the soles of her feet on the bed or, if she is on a table adapted for gynecological examinations, the extensions provided for the feet or sometimes, when there is no such table to be had or the patient is too ill to be moved to one, she is turned in bed so that she lies across the latter with her feet resting on two stools or chairs placed at the side of the bed. Space enough for a chair for the examiner must be left between these two supports and, if possible, a board, the length of the width of the bed and about two feet wide, should be put across the bed under the springs, to prevent the mattress sagging under the patient. When the latter is placed either as just described or on a table, the buttocks must come to the extreme edge, or even slightly beyond the edge, of the table or bed.

3. **Dorsal lithotomy or dorso-sacral position** in which, if the patient is in bed, she is placed across it, lying on her back, with one pillow under her head, her buttocks slightly beyond the mattress, her hips slightly elevated on a pillow, her knees flexed on the abdomen, and fastened in position with a strap or a sheet folded diagonally and passed under her knees and either under her neck or else one end under her back and the other across her chest and, in either case, the two ends are tied either over one shoulder or at the knees. If the patient is on the examining table she is placed on her back with her legs at right angles with her thighs and held in position by placing the feet in the stirrups that are attached, one on each side, to the foot of the table.

4. **The Sims or left lateral position** in which the patient lies on her left side, somewhat obliquely across

the table or bed, with the left side of her face and her left shoulder and breast resting upon a flat pillow; her left arm lying passively behind her back and her right one loosely at her side; her thighs flexed, the right one more than the left. The buttocks should be at the extreme edge of the table and, as a rule, one of the table extensions is drawn out to support the feet.

5. **The knee-chest position** in which the patient kneels, her knees slightly separated, her chest and one side of her head resting on a pillow placed on a level with her knees; her elbows bent and her forearms resting on the bed or examination table.

6. **The standing or erect position** in which the patient stands with her knees separated about ten inches, one foot on the floor, the other on a low stool, and her hand resting on a table or other support.

7. **The Trendelenberg position** in which the patient lies supine on an inclined plane, her head lower than her abdomen, her knees flexed, and her legs resting against and, if she is under the influence of an anesthetic, tied to a support. Operating tables have special supports for this position; for an operation in the home, if such a table cannot be secured, a chair can be placed with the front edge of the seat and that of the top of the back resting on one end of a narrow table; the back of the chair will thus serve as the support for the legs.

Preparation for a patient for a vaginal examination.—This must necessarily differ somewhat according to circumstances. When possible, if the patient is at all constipated, she is given a cathartic or an enema some time previous to the examination, because distention of the lower bowel with feces may interfere with the inspection of adjacent genital organs. Sometimes a vaginal douche is also given, but this must never be

done without knowing the examiner's wishes, for the physician frequently wishes to see existing conditions before they have been changed by a douche. It is, however, always necessary to observe if the surrounding parts are clean while placing a patient in position and, if not, to make them so.

When the patient is staying in the hospital her clothing for the examination, unless she remains in bed, usually consists of a nightgown, wrapper, and laparotomy stockings. In the home and, sometimes, in the hospital, ordinary stockings and open drawers are substituted for the laparotomy stockings. When the patient remains in bed, the wrapper is omitted and the upper part of her body is covered with a blanket or shoulder wrap. A patient coming to the hospital or dispensary, etc., for the examination, usually retains the clothing she is wearing with the exception of her corsets and dress skirt, but all waist bands must be unfastened and, if the clothing is at all soiled, towels must be pinned around the portions surrounding the parts to be examined before the sheet is draped about the patient.

Particularly essential points to observe when arranging the sheet about a patient in any of the positions just described are: That the parts to be examined must be exposed as much as necessary, but not more, and that, therefore (1), the sheet used to prevent exposure must be so arranged that it will be sufficiently well secured to prevent it slipping, especially around the parts being examined, and thus getting in the physician's way or allowing of unnecessary exposure, (2) the sheet must be so draped that the outline of the patient's figure is not discernible, and (3) even the parts that are to be exposed are to be covered until the physician needs the covering removed. and this must be so arranged that it can be

thrown back without disarranging any other portion of the drape.

Procedure when arranging a patient for a vaginal examination.—Have the patient lie on the table or across the bed, cover her abdomen and legs with a sheet, placing this lengthwise across her.

Arrange her in position.

Fold her nightgown or skirts up above the pubes in front and the buttocks behind, arranging them very loosely over the abdomen so that they can be moved upward quickly if the physician wishes to examine the latter. Put a towel around the lower border of the folded clothes.

If treatment is to be given, put the Kelly pad (covered with a dressing towel where the patient will rest upon it), in position to catch drainage.

Proceed to drape the sheet around the patient.—Methods in common use are as follows:

For the dorsal positions:

Method 1.—Gather the center of the lower edge of the sheet up sufficiently far to expose the vulva, twist one of the lower corners around each foot, but allow the sides to hang like curtains on either side of the legs. Place a towel on the abdomen with one end screening the vulva. Turn this end up if necessary when the examiner is ready.

Method 2.—Proceed as for Method 1, but retain the sheet in place by tucking the upper corners under the patient's buttocks and back, instead of twisting the lower ones around her feet, and leave the latter hanging so that there will be, as it were, a curtain on both sides of her legs and feet.

Method 3.—This method requires a fenestrated sheet. Place this cornerwise over the patient with the opening

over the vulva; turn back the lower point and tuck it under the buttocks, twist the two side corners securely around the feet, but allow the sheet to hang on both sides of the legs; bring the upper corner of the sheet well up over the abdomen and turn back its upper portion so that the point will fall over the vulva. This is raised when the examiner is ready.

Arrangement of the sheet for Sims's position:

Method 1.—Bring one half the length of the sheet behind and around the patient. Tuck the lower edge of the half falling over her thighs and legs and the continuation of this, which forms the upper border of the part brought around the patient, between her thighs and legs, leaving it loose around the vulva. Avoid unnecessary exposure by placing a towel in such position that it will cover the exposed portion.

Method 2.—A fenestrated sheet is used for this method. Arrange the sheet so that its opening will expose the vulva. Tuck one corner under the patient's back and another under her legs. Cover the vulva until exposure is necessary with either a corner of the sheet or of a towel placed on the upper part of the thighs.

To drape a patient in the knee-chest position gather the lower ends of the sheet up above the parts to be examined, pin the fold to the patient's wrapper or night-gown in order to hold it in place, and pin the sides of the sheet on the thighs and legs. Place a towel where it will screen the exposed parts until the physician is ready.

If a fenestrated sheet is used, place the aperture over the part to be exposed and cover this with a towel.

When the patient is in the standing position, pin the sheet around her waist like a skirt with the sides overlapping, the under edge being directly in front and the upper one almost at the side.

How to hold a Sims Speculum.—An important item in the assistance often required of a nurse during examinations and treatments when the patient is in the Sims position is to hold the Sims speculum. To do this, stand on the left side of the patient, put your left arm across her hip, and separate the buttocks with your left hand. After the doctor has inserted the speculum, grasp its handle with your right hand and hold it so that your thumb and fingers are on the inner side—*i. e.*, next to the patient.

Demonstration 55

Disinfection of the Hands and of the Patient's Skin in Preparation for Treatments

Requisites.—For the preparation of the hands:

1. Hot and cold water.
2. Nail-brushes and orange-sticks in a disinfectant.
3. The disinfectant or disinfectants used for the disinfection of hands in the hospital.

For the disinfection of the patient's skin:

1. A treatment preparation tray. This usually holds: three wide-mouthed, glass-stoppered, one-ounce bottles containing (a) iodine, (b) alcohol, (c) either ether or benzene, two small covered glass jars containing, (a) sterile gauze or cotton sponges, (b) sterile applicators made of wooden toothpicks covered at one end with absorbent cotton; a deep covered jar or wide-mouthed bottle containing 95% alcohol and a pair of sterile forceps; a small receptable for used sponges and applicators.
2. An operation preparation tray. This generally holds: two pitchers with a capacity of between one and two pints containing hot (120° F.) sterile water; four

bowls that will hold about half a pint; two bowls or glasses that will hold about two ounces (for the alcohol and ether); a bowl containing a disinfectant, nail-brush, and orange-stick; bottles of soft soap, ether or benzene, and alcohol, and other disinfectant if used; packages of sterile towels, compresses, gauze or cotton sponges, and rubber gloves; a jar containing alcohol, a pair of sterile forceps and sterile safety pins; a dressing rubber, and two dressing towels—these need not be sterile; a bandage and binder, a safety razor and a depilatory paste.

3. A Kelly pad and pail.

The nail-brush, pitchers, bowls, and glasses are either sterilized before use by boiling for 5 minutes or else, after use, they are boiled, dried with a sterile towel, piled together and rolled in a sterile towel, sterile gloves being worn while drying and wrapping them. The razor, after use, is to be taken apart and very carefully put into a basin filled with ½ per cent. liquor cresolis comp. or other suitable disinfectant. It stands for 15 minutes and is then washed with soap and water, rinsed, and dried thoroughly. Care must be taken not to let the blade knock against any hard suface. New and used blades should be kept separately.

Disinfection of the Skin

The moist skin with its protein-containing secretions and disintegrating epithelial cells affords a particularly favorable soil for the propagation of various species of bacteria; therefore numerous varieties, especially those of the pyogenic species, are constantly present, both on its surface and in the ducts of its multitudinous glands. However, so long as the skin is unbroken, these organisms are harmless, but any break in the skin may permit

their penetration to tissues which they can injure and then inflammation and suppuration are likely to occur. This is especially the case if the tissue cells are previously injured, as by a wound, either operative or accidental, or the use of a blunt hypodermic needle, or the injection of an irritant drug, because injured cells cannot protect themselves from the action of bacteria to the degree that normal cells can. Consequently, the amount of disinfection to which the skin must be subjected in preparation for a treatment depends upon (1) the size of the puncture or incision that is to be made in it, naturally the larger the opening the greater the possibility of infection; (2) the possibility of injury to tissue cells.

It is almost impossible to render the skin sterile because (1) it cannot be subjected to a high enough temperature to destroy bacteria without injuring the skin itself; (2) ordinarily, it is not practical to expose the skin to the influence of germicides long enough to obtain even a very thorough surface disinfection; (3) the epidermis is very impervious to most disinfectants; iodine and, though to lesser extent, potassium permanganate penetrate the outer epithelium better than most substances that can be used for skin disinfection, but even these, especially the latter, cannot be depended upon to destroy germs in the deeper parts of the ducts.

However, though it is hardly possible to render the skin absolutely sterile, the present methods of cleansing and disinfection, if properly carried out, will prevent infection.

To obtain the greatest possible degree of surgical cleanliness five things are necessary (1) the skin glands must be stimulated in order to promote a profuse secretion which will wash bacteria out of the ducts, hot water

is generally used for this purpose; (2) a fat solvent must be used to dissolve the sebaceous secretion on the surface of the skin; ether and benzene are about the best of the fat solvents suitable for this purpose, hot soap suds and alcohol are also good, especially the former, and alcohol between 70 and 50% and green soap are also disinfectants; (3) friction is essential to remove dissolved fat, disintegrated epithelial cells, and bacteria and as much friction should be used as possible without causing undue irritation of the skin; (4) after the surface of the skin is cleansed secretion should be checked, the cold induced by the evaporation of the ether or benzene and alcohol aids in this; (5) the use of a disinfectant.

The amount of disinfection that a patient's skin usually requires in preparation for a treatment depends, as previously explained, upon the nature of the treatment, for example when the treatment consists merely of the introduction of a fine sharp needle and subsequent injection of a sterile non-irritating solution all that is usually necessary is to wash the surface of the area with, for example, alcohol (*alcohol is very commonly used because it is both a detergent and disinfectant*), but if needles with a large bore are used or an irritating solution is to be injected extra care is necessary and, naturally, this is even more imperative when an incision is to be made. Especially in the latter case, the cleansing should include, if possible, all the measures previously mentioned as necessary to make the skin surgically clean, however, when iodine is used as a disinfectant, water cannot be used for the cleansing, if this has to be done shortly before the iodine is to be applied, because moisture on the skin hinders the penetration of the iodine.

The same considerations apply to the **cleansing of the worker's hands** as to the patient's skin. Thus an

ordinary cleansing of the hands is generally all that is necessary before preparing and giving a simple hypodermic injection, but when preparing for treatments that require the use of many sterile articles, or to assist with or give such treatments, further preparation of the hands, such as is described on pages 344 to 346 is essential. Method 2 is generally considered a sufficient preparation, especially when sterile gloves are worn, for the arrangement of treatment trays and for assisting with or giving treatments that do not necessitate touching anything that will come in contact with a wound. It is to be realized, however, that even Method 1 will not render the hands sterile, that even sterilized gloves are not entirely satisfactory, and that therefore **instruments and dressings are to be handled as far as possible with sterile forceps.**

Important points to remember in connection with the disinfection of the hands:

1. The hands must be kept in good condition by (a) a sufficiently frequent use of lubricants; (b) handling soiled material, such as used dressings, with forceps.

2. Before and while disinfecting the hands, the cuticle under the top of the nails is to be rubbed, even when it looks absolutely clean. A flat-edged orange-stick is much better than a metal file for this purpose as it is less likely to roughen the cuticle.

3. When disinfecting the hands there is to be no guessing as to the time, it is to be ascertained by the clock.

4. Use as hot water as possible for the first part of the cleansing and cold for the last in order to check the activity of the glands so that the surface of the skin will not become covered with their excretions after it has been disinfected.

5. Do the last part of the cleansing under running water so that all soiled matter will be permanently washed off the skin.

6. Rinse the soap from the skin thoroughly before using the disinfectant. This is especially important when bichlorid of mercury is used, because the soap combines with the acid or salt that is added to bichlorid to render it more soluble and lessen its tendency to combine with protein material and, therefore, if the salt or acid (whichever has been used) is removed, the disinfecting power of the mercury is lessened and it is much more irritating to the skin.

Procedure in disinfecting the hands:

Method 1.—See that the finger nails are sufficiently short. Add some liquid or soft soap to a basin, three quarters full of hot water; immerse the hands and arms to above the elbows in this and allow them to remain for two minutes. Take a sterilized nail-brush[1] and scrub thoroughly every part of the hands and arms to well above the elbows (including the finger nails) for five minutes. Clean the cuticle under and around the nails with an orange-stick. Scrub the hands and arms under running water[2] for three minutes using cold water for the last half of the time. Be sure that all soap is removed and then use the disinfectant that the surgeon desires. Rub this into the skin.

Disinfectants for the hands that are very commonly used after preparing them as above are:

[1] Nail-brushes and orange-sticks used for this purpose are boiled each day or, sometimes in the operating-room, after each operation, for five minutes and then put into a disinfectant. They are rinsed after use and at once returned to the disinfectant.

[2] When this cannot be done under running water, *i. e.*, under the faucet, the water in the basin should be changed.

1. Chlorid of lime and carbonate of soda. To use these, take equal parts of each and make them into a paste with water, rub this on the skin (*as soon as the mixture is wet, chlorin gas, which is a good disinfectant, is liberated*). Wash off the paste with sterile water and then immerse the hands and arm in bichlorid of mercury 1 : 2000. Dry the parts with a sterile towel.[1]

2. Alcohol 95%. After the mechanical cleansing, dry the parts with a sterile towel and then bathe and scrub them with alcohol, using a sterile gauze compress for the purpose. Dry the skin with a sterile towel.

3. Harrington's solution. Immerse the parts in this for one minute and then rub them with alcohol and dry them with a sterile towel.

Formula of Harrington's Solution:

Corrosive sublimate	0.8 gm.
Alcohol 94%	640.0 c.c.
Hydrochloric acid	60.0 "
Water	300.0 "

4. Bichlorid of mercury and potassium permanganate solution. Immerse the hands and arms in hot bichlorid of mercury 1 : 1000 for two minutes and then in a potassium permanganate solution until the skin is deeply colored. This is removed after operation by washing with oxalic acid solution followed by ammonia water to neutralize the effect of the oxalic acid. This method is preferred by some surgeons because the permanganate forms a thin film over the skin and this, it is thought, may prevent the egress of bacteria from the deeper parts of the skin after disinfection.

5. Iodine. Paint the skin with the iodine. If 7%

[1] When wet rubber gloves are to be put on the drying is omitted.

is used allow it to dry and then wash it off with alcohol. If 3% is used do not remove it until after the operation.

Method 2.—Scrub the hands and forearms to above the elbows with hot water and soap for two minutes; clean the nails and the cuticle around them; repeat the scrubbing for another minute, using fresh soap and water; rinse and scrub the parts in cold, preferably running, water for one minute. Scrub them with the disinfectant (using sterilized gauze compress or brush for the purpose) for at least one minute.

Bichlorid of mercury 1:1000 is a very commonly used disinfectant following this shorter method of cleansing the hands.

To put on rubber gloves properly requires practice and thus the pupils should drill doing this with dry and with wet gloves until they can put them on as quickly as it is possible to do so without touching their outer surface

Points to be considered are: always choose gloves that fit properly, for, if they are too small, they are hard to put on, and they, by their pressure, interfere with the tactile sense and cause discomfort; if they are too large they prevent dexterity of manipulation.

While putting on sterile gloves, hold your hands away from your body so that the gloves will not come in contact with anything unsterile.

If the gloves are to be put on dry, arrange the wrapper in which they were sterilized so that it can be opened without touching the outside before you wash your hands.

After washing and disinfecting your hands, **if the gloves are dry,** dry your hands, slip either a finger or

sterile forceps under the outer fold of the wrapper[1] and open it. Dust your hands with the sterile powder in the package (see page 43), take hold of the upper edge of the glove for the left hand, and, holding it thus, insert your hand and pull the glove into place. Put on the other glove and in doing so avoid touching your arm or hand; it will not matter so much if you touch the outer surface of the glove with your gloved hand. Turn back the cuffs by slipping a finger under them and raising the fold upward. If a sterile long-sleeved gown is worn the cuffs of the gloves are not turned back until this has been put on.

To put on the gloves when wet, do not dry your hands, and leave some solution or sterile water in the gloves; hold your hands above a basin while you are adjusting the gloves. Do this in the same manner as when putting them on dry. When each glove is in place, empty any remaining solution from it by raising the hand and stretching the cuff of the glove—be very careful not to touch your arm with the outer surface of your glove while doing so.

Procedure in the preparation of the patient's skin for aseptic treatments and operations:

Method 1. — With sterile forceps, take a sterile sponge from the container, with your left hand lift the stopper from the bottle or jar containing the alcohol, dip the lower portion of the sponge into the alcohol, replace the stopper; rub the wet sponge back and forth over the proposed site of injection several times, being

[1] Especially in the operating room, this is often done by a nurse whose duty it is to help the surgeons and "sterile nurses" adjust their sterile aprons, etc., and, if her hands are not as sterile as possible she must handle the outer and not the under surface of the wrapper.

careful not to let the tip of the forceps touch the skin, make considerable pressure as you rub. Drop the sponge into the receptacle provided for the purpose; replace the forceps in the alcohol in which they are kept.

Method 2.—To use iodine, take an applicator from the container with sterile forceps, replace the latter in the alcohol, dip the cotton of the applicator into the iodine, rub this on the skin. Let the iodine dry. If a second application is necessary take a fresh applicator, do not put a used one into the iodine. If a large surface is to be painted, sterile sponges, held with forceps, can be used, instead of applicators. An important point to remember in connection with the use of iodine is that if it runs between folds of skin or under parts where it will not dry readily, it is likely to blister, thus, this must be prevented, or, if the iodine is needed in such places, they must be exposed to the air until they dry.

Method 3.—This method is used when an incision is to be made and there is not time to allow the skin to dry if water is used. Shave the skin, if necessary, without the use of soap. Wash it with benzene or ether in the same manner as alcohol is used in Method 1. Cover it with a sterile compress and leave it thus until about two minutes before the surgeon is ready, then paint the skin with iodine.

Method 4.—Have the operation preparation tray and other articles mentioned on page 340, at hand.

Give your hands an ordinary washing with soap and water and dry them.

Remove the outer wrappers from the dressing towels, gloves, etc., or, if they each have but one, arrange it so that it can be opened without touching the outside. Prepare some hot (120° F.) soap solution in one pitcher, using enough soap to get a good lather. Pour a small

amount of this into a bowl; drop from two to six sponges (according to the amount of surface to be prepared) into this.

Draw the patient to the side of the bed if necessary.

Expose the part to be prepared; if this is the abdomen, place a wrap across the patient's chest.

Protect the bedding with a Kelly pad and dressing rubbers covered with dressing towels, if much of the body is to come in contact with them.

Shave the area for operation or, if the surgeon approves, apply a depilatory paste.[1] If the latter is used spread it over the area (with a wooden or glass spatula) in a layer about an eighth of an inch thick. Leave it for five minutes. If it is used around the vulva, first apply some sterile oil to the contiguous mucous membrane (using a sterile sponge held with sterile forceps), for the paste is apt to irritate mucous membranes.

Wash the skin sufficiently to remove paste, hair, etc. Wring out a folded towel or, for a small area, a compress, in the hot soap solution, put this over the part, cover it with a folded towel.

Wash and disinfect your hands according to Method 2 and then, using a sterile towel to handle unsterile articles, pour some soap solution into a clean bowl and some hot sterile water into another, open your package of sterile sponges. Place sterile towels around

[1] The paste in common use is made of crystallized sodium sulphid three parts (*e. g.*, three drams), fresh unslaked lime ten parts, starch eleven parts. These ingredients are thoroughly pulverized, well mixed, and put into an absolutely dry, wide-mouthed, glass-stoppered bottle. When required as much of this as necessary is made into a paste with sterile water.

Some surgeons prefer this paste to shaving because it removes not only the hair, but, also, loose epithelium and thus it aids materially in cleansing the skin and it has some disinfectant value.

the area to be prepared, if this is the rule of the hospital.[1]

Remove the towels covering the skin and scrub the latter with either a sterile brush or a sterile compress and soap solution for from two to ten minutes, depending upon the extent of surface that has to be cleansed and of the incision that is to be made. For a preparation that requires more than two minutes' scrubbing change the soap solution two or three times. Take special care to clean between all folds of fat, if present, and, when preparing the abdomen, the umbilicus and around the groin.

Remove the soap and wash the area with sterile water and, when possible, pour water from the pitcher over the part. Wipe the latter with a sterile towel or compress and then cover it with a fresh one. Dry the rubber and Kelly pad, and remove them.

Pour some ether or benzene and alcohol, and other disinfectant, if used, into the bowls provided for them.

Disinfect your hands by scrubbing them vigorously with disinfectant. In some hospitals, especially when the preparation is for a large incision, it is the rule that, after the hands are disinfected, gloves be put on.

Wash the part thoroughly with (a) ether or benzene (b) alcohol. Cover it with a sterile towel or compress and secure this in place with a bandage, binder, or safety pins as best suited to the location. If pins are used do not insert them over the prepared area.

Iodine is applied a few minutes before the incision is made.

[1] Sterile towels should be used when unnecessary exposure is to be avoided, as around the pubes, but, otherwise, it is quite possible without the use of towels to prevent anything unsterile coming in contact with the area being prepared or with the articles used for the preparation.

Demonstration 56

Preparation of Treatment Trays and Bundles

Requisites:

1. Trays.

2. Towels, some of which must be arranged in the manner in which the bundles of sterile towels are kept.

3. Instruments and apparatus for a treatment requiring both sterile and unsterile articles.

4. Instruments, etc., for all the treatments for which the appliances are sterilized and kept in bundles ready for use.

The main objects of this demonstration are:

1. To show the general scheme of collecting and arranging the articles required for treatments.

2. The manner of handling sterile articles, including towels and aprons.

3. The preparation of emergency treatment bundles.

Important points to remember when preparing for treatments are:

1. Put all small articles on a tray[1] and cover them with a towel for transportation to the bedside. If the articles are sterile, the tray should be either sterilized by boiling or else washed with lysol solution, at least 1%, dried, and covered with a sterile towel. Pile together in the manner that will be most convenient for carrying them to their destination all unsterile articles that are too large for the tray.

2. Never put unsterile articles on a tray with sterile ones, unless the latter are few in number and are separated by a sterile towel.

[1] In some hospitals the tray is covered with a dressing towel, but in others this is only done when the articles it is to hold are sterile.

3. Arrange the articles on a tray as far as possible in the order in which they will be used.

4. Be sure that everything is in order, *e. g.*, that scissors, knives, and needles are sharp and syringes working properly.

5. Be conscientious in your aseptic technique.

6. Be sure that you have everything required.

Considerable time can be saved when preparing for treatments by a proper system in the order of doing the work. This is especially true when some of the articles are to be sterile. It would be quite impossible to give definite rules for the order of procedure; in fact, this is so dependent upon varying circumstances that it has to be decided to some extent with each preparation. Considerations to bear in mind, however, are:

1. To collect articles that are kept in the same place at the same time.

2. Usually, one of the first steps in the preparation is: put water to heat so that it will be boiling when needed for the instruments, etc., and, if there are any glass utensils to be sterilized, put them into the cold water.

3. The instruments, especially the sharp ones, are not to remain in solution a minute longer than the time required for their sterilization, (this is given in Chapter III) therefore, if their sterilization is completed before your hands are disinfected, raise the sterilizer tray from out the water and either place it across the top of the sterilizer or on a sterile towel and cover the instruments with a sterile towel.

4. Collect and arrange all unsterile articles before you disinfect your hands.

Three very essential facts to be remembered in connection with the preparation for treatments are:

1. That strict asepsis is to be maintained whenever (a) the treatment is connected with a wound of any kind; (b) when an incision or puncture is to be made; (c) when anything is to be inserted in a cavity (*e. g.*, the bladder) that contains material which will be decomposed by bacteria into substances irritating to the tissues of the organ, for this will facilitate infection.

2. That efficiency in aseptic technique is attained only by constant attention and thought when preparing for, assisting with, or giving, treatments until all details of procedure have become a matter of habit.

3. That glass utensils, such as catheters and syringes, often become cracked during sterilization and sharp instruments blunted and that, therefore, two of each kind should be prepared for use and a glass nozzle is never to be inserted in a body cavity such as the bladder until it is inspected.

Some of the particularly important points to remember in connection with asepsis are:

1. That to make anything sterile it must be exposed to the influence of heat or a disinfectant the length of time that tests have shown the temperature or strength or solution used require to be effectual.

2. That if a sterilized object is to remain sterile it must not come in contact with anything unsterile. To avoid this the following precautions are imperative: (a) Remove all unsterile objects from the place where you are to put the sterile ones and if there is any danger of the sterile articles coming in contact with the table and surroundings, cover them with sterile towels. (b) Wash the rim of a bottle before pouring out a solution or else discard the first of the solution that flows over it. (c) If necessary to put down the cover of a jar containing sterile supplies or the stopper of a solution-bottle place it with

its lower side or end uppermost. (d) Use sterile forceps when possible for moving sterile instruments and supplies, especially when taking the latter from their container, for the hands are never absolutely sterile and even gloves cannot be as easily perfectly sterilized as metal. Forceps used for this purpose are often kept, after sterilization, in alcohol 95%.[1] (e) Never touch the points of sterile instruments but take hold of them as far as possible from the point that is to be inserted in the wound or tissues or that is to come in contact with sterile supplies. (f) If necessary to move any unsterile object after you have disinfected your hands take hold of it with a pair of sterile forceps or a sterile towel; if you use the former, resterilize it before you use it for anything sterile; if you use the towel, be sure, if you use it a second time, not to touch the side that has become unsterile. (g) Be careful when unfolding sterile towels and aprons not to let the side that is to be kept sterile come in contact with anything unsterile. (The pupils should practice doing this and putting on aprons until they can do these things deftly and without touching the surface that is to be kept sterile.)

The Sterilization of Articles Used for Treatments

Instruments, needles, and catheters of all kinds are sterilized before use in the same manner as after use, as described in Chapter III.

Douche nozzles are boiled for five minutes after use, but, in some hospitals, they, after sterilization, are

[1] 95% alcohol is not as good a disinfectant as 70%, because it coagulates the protein on the exterior of the bacteria and thus is prevented penetrating to their vital parts, but the water in 70% causes the metal to rust.

put into a jar[1] containing a disinfectant such as bichlorid 1:5000 and are then not boiled before use, except when the douche is given following operation on the parts douched or their surroundings, in which case, the can and tubing are also boiled.

Rubber rectal tubes and stomach tubes are boiled after, but not, as a rule, before use, but stomach tubes should be rolled in a sterile towel after sterilization, not so much with the idea of keeping them sterile as of keeping them clean. It is undesirable to boil rubber articles of this kind oftener than necessary, for doing so softens the rubber; this and the method of sterilizing them was explained in Chapter III.

Aspirating bottles and other appliances used to receive from the body material that is likely to be examined for bacteria should be sterilized by boiling for five minutes before use.

Preparation of Emergency Bundles

It is a common custom in hospitals to have the instruments and dressings necessary for treatments that are likely to be given in emergencies rolled, after they have been sterilized, in sterile towels and put away in a covered container, such as a metal box that is sterilized at frequent intervals.

It can be easily appreciated that it is most important, since these things will not be sterilized again before use, to take special care in their sterilization after use and to keep them sterile during drying. To do this, wear dry sterile gloves, cover the table at which you work with

[1] The jar used for this purpose is to be sterilized daily by boiling for five minutes and refilled with fresh solution. A thin layer of absorbent cotton should be kept in the bottom of the jar.

sterile towels, and do the drying, as far as possible under sterile towels, using sterile gauze for the purpose.[1] Drying long pieces of rubber tubing, such as are used for hypodermoclysis and intravenous infusion, is particularly difficult and it takes time. It is usually done by stretching and pressing the tubing, beginning at the center and working first toward one end and then toward the other, and wiping away moisture forced to the openings. The drying is more easily accomplished if it is begun as soon as the tubing is removed from the sterilizer. It is most important that it be done thoroughly for, if moisture is left in the tubing, the rubber in the interior will be rotted and small particles may be washed into the tissues or, if the tubing is used for an intravenous infusion, the veins. Old tubing should never be put into such bundles since it is more easily disintegrated than new.

Other important points to remember are: (1) To be sure that the instruments, etc., are in perfect order—test all syringes with sterile water before drying them. (2) Be sure that everything belonging to the outfit is included in the bundle. It is customary to have a card on which the names of the articles belonging to a bundle are inscribed that can be referred to when there is any doubt regarding the accuracy of the latter's contents. In some hospitals this card is attached to the bundle with a rubber band, in others, the cards for all the bundles and those inscribed with the utensils required for the various treatment trays are kept in the same cupboard with these articles. (3) Arrange the instruments in such order that there will be no danger of sharp ones being injured; their points should be protected with cotton and, usually, they are best put by themselves between sterile towels.

[1] This gauze should be washed after use and kept.

The latter can be used to cover the bedding during the treatment. (4) Wrap the apparatus in at least two folded sterile towels and secure the bundle with elastic bands; do not use pins.

Demonstration 57

The Collection and Preparation of Specimens of Excreta, etc., for Examination

Requisites.—1. The various utensils used for sending specimens of urine, feces, etc., to the laboratory.

2. Labels and any forms that are sent with specimens to the laboratory.

3. Articles required to obtain a specimen of urine from a small child—ones commonly used are: A Chapin urinal and tape to hold it in place; or, absorbent cotton, a fine-meshed gauze compress, oil muslin, and diaper; a small bedpan and two pillows protected with rubber cases or, for male children, a test tube or small bottle.

Object of the specimens.—By chemical and microscopical examination of excreta, discharges, vomitus, and the like, the physician can often obtain much information regarding the nature of the disease from which a patient is suffering and also the progress of the disease and the results of the therapeutic measures employed.

General requirements in the preparation of specimens for examination are:

1. **Strict attention must be paid to detail.**—Much delay and annoyance to patients, doctors, and laboratory workers are often occasioned by the nurses failing to observe the details of technique that are taught in connection with the collection and care of specimens. Even apparently unimportant details (such as the side of the

specimen container on which the label is put, the order in which the various items of information are inscribed on the label or request blank, the manner of fastening the cover on the container) should be carried out with exactness because, when examining a number of specimens, there is a great deal of repetition in the work and, therefore, it is greatly facilitated when all the conditions under which it is done are the same, and to make these so, as far as the nurses are concerned, requires only a little attention, until the points are fixed in their memories.

2. **To avoid mistakes when a specimen is wanted at a certain hour or a 24-hour specimen is to be saved** (*i. e., all that is discharged during 24 hours*) special measures must be taken, these usually include (a) putting a colored slip of paper containing the necessary information on the patient's chart, if this hangs on the bed, if not, in the lavatory where the utensils are emptied; (b) telling everyone who is likely to attend to the patient that the specimen is required; (c) telling the patient, unless she is too ill; this is especially necessary when the patient is not confined to bed.

3. **The amount of material to be sent as a specimen** varies, *e. g.*, a *24-hour specimen* calls for every drop passed in the 24 hours; when a stool or other discharge is to be examined for ameba, gravel, mucus, or pus, as a rule, the whole amount passed at a time is wanted; for routine examination of urine about 4 or 5 ounces are required, because the routine examination of urine generally includes ascertaining its specific gravity and about 4 or 5 ounces are necessary to float the urinometer.

4. **Use the right kind of receptacle** for the various types of specimens. No very definite instructions can be given regarding this because the kinds used in different hospitals vary, but as a rule special wax-lined paper

boxes are used for stool specimens, except when these are to be kept warm, in which case they are usually sent to the laboratory in the bed pans. Sputum is generally sent to the laboratory in the sputum cup, urine in conical-shaped glasses or, a *24-hour specimen* in a gallon bottle; vomitus is sometimes sent in the same kind of a glass as urine and sometimes in a sputum cup or a paper box.

5. **Never use cracked receptacles.**

6. **Be sure that receptacles are absolutely clean and, if a specimen is to be examined for bacteria,** the receptacle must be sterilized by boiling for 5 minutes and either sterile cotton or a sterile cork used as a stopper; otherwise it might not be known whether the bacteria found were in the specimen originally or derived from the utensil, also everything else that comes in contact with the specimen is to be sterile.

7. **As soon as a specimen is put into a receptacle** the latter is to be covered.

8. **All the information that the laboratory workers require** must be written on the label or other form provided for the purpose. This usually includes: The date, the patient's name, the number of the room or ward in which the patient is, the doctor's name, the reason for the examination and, in some cases, the location from which the specimen was obtained and how it was obtained.

9. **Preservatives** occasionally have to be added to specimens that are to be kept for a time (*e. g., a 24-hour specimen of urine*), especially in hot weather, and there is sometimes a standing order for the use of a special one, otherwise, however, one is only used if specially ordered and, whenever one is used, its name and the amount must be stated on the label or request-blank sent to the laboratory with the specimen. The reason for this is that the antiseptics used as preservatives interfere with cer-

tain tests: *e. g.*, formalin, with some tests, will give the same reactions as sugar and albumin and it interferes with the tests for bile and indican, therefore it cannot be used when these tests are to be made; thymol gives the same reactions with some tests that bile and albumin do; chloroform, with some tests, will give the same reaction as sugar, chloroform however can generally be used, even when a specimen is to be examined for sugar, provided the technician is advised of its use, because, as it is very volatile, it can be removed before the test is made by heating the specimen.

10. **A note is to be made on the patient's chart** when a specimen of any kind is taken to the laboratory.

11. **There are sometimes certain requirements to be fulfilled in the laboratory** when specimens are taken there that must not be forgotten, such as the place in which they are to be put, and entering a notice in the laboratory record book.

12. **Whenever unusual conditions are noted in excreta, vomitus, etc.,** the material should be shown to the head nurse.

Special points to be remembered in connection with the collection of specimens of different excreta, etc., are as follows:

Feces: The chief special precaution required in obtaining specimens of feces is necessary when the examination is to be for ameba. In such case, the feces must be kept warm until the examination is made. Therefore, the bedpan must be well warmed before use and, if the defecation is emptied into any other container, the latter must be warmed; also, it should be taken to the laboratory at once or, if this is impossible, put into a pan of hot (about 110° F.) water and, if necessary, the technician must be notified.

The examination of feces for biliary calculi, or worms, which is sometimes left to the nurses, is generally carried out about as follows: Break up or stir the feces with a stick or a spatula and, if necessary, add water and strain the material through gauze stretched across a specimen cup or bedpan or through a fine wire strainer.

Sputum for examination should, when possible, be obtained in the morning before food is taken, as it is then more likely to be free from admixture with other substances. The patient should be given some clear water —not a mouth wash or antiseptic of any kind—and asked to rinse her mouth thoroughly and then to endeavor to cough up discharge from the bronchi or lungs, and she should be given an absolutely clean specimen cup or glass into which to expectorate.

To obtain a specimen of sputum from a small child is sometimes a difficult thing to do. One way that sometimes answers is, when the child coughs, to turn it face downward and to place a clean basin where it will catch any discharge from the mouth. Another method is to wind some absorbent cotton around one end of an applicator or else hold a small sponge of absorbent cotton with an artery clamp or sponge holder and, after putting something between the child's teeth (such as a small roll of two or three inch bandage or a large cork cut in half) at one side of the mouth, rub the back of the pharynx with the cotton. This usualy makes the child cough, which forces discharge from the bronchial tubes to where it can be seen and caught with the cotton. The applicator or sponge is then dropped into a sterile test tube and the latter plugged with cotton.

Urine.—Special details to be considered in connection with specimens of urine are: In almost all hospitals it is customary for a specimen of urine to be sent to the

laboratory (1) the morning after a patient is admitted to the hospital; (2) immediately upon the admission of an emergency surgical or obstetrical patient; (3) the morning after a surgical operation or a confinement; (4) whenever ordered by the physician. The bedpan or urinal is to be thoroughly washed before use and, for a female patient, the vulva is to be wiped with a damp cloth. For a sterile specimen a female patient must be catheterized and, in any case, the urine must be received into a sterile utensil. This, if possible, should be the bottle or glass in which it is to be sent to the laboratory and it must be securely closed with a sterile cover or stopper.

Technic for the collection of a 24-hour specimen of urine.—Have the patient void urine at a stated hour, throw the urine away, but save all that is voided subsequently until the same hour next day. As urine is readily decomposed by bacteria the bedpan or urinal and the bottle into which the urine is poured must be sterilized and the latter must be kept tightly stoppered with a sterilized cork or cotton plug. As previously stated, a preservative is commonly used, especially in hot weather.

To obtain a specimen of urine from a small child use a Chapin urinal, if possible to obtain one. This answers for both boys and girls. To apply it, put tapes through the openings of the urinal flaps, place the large opening over the vulva, or, with a boy, the penis, with the funnel end downward and secure the urinal in place by tying the tapes around the abdomen and groin. Put the funnel opening into a specimen bottle or, if the child is very restless, omit the bottle and plug the opening with a cork. If such a urinal cannot be obtained, a small glass bottle or test tube can be used for a boy baby; place the penis in the bottle, and hold the latter in place with tape or a bandage tied first

around the neck of the bottle or tube and then around the child's waist. It is somewhat more difficult to obtain a specimen from a girl child, but one method commonly used is to fold a pad of sterile absorbent cotton in a compress of fine meshed sterile gauze, put this on a piece of oil muslin and place the pad where it will catch the urine when it is voided; use a diaper to keep the pad in position. After the urine has been voided a sterile rubber glove is put on the right hand and the urine squeezed from the pad into the specimen glass. The objection to this method is that, unless care is taken, pieces of cotton will be in the urine and interfere with microscopic examination. The gauze is used to lessen the danger of this and, therefore, if it is not of very fine mesh it should be doubled. Another method is to notice the frequency with which the child urinates and when it is nearly time for it to do so hold it over a bedpan or else put the pan between two pillows (protected with rubber cases) and lay the child in position for the urine to flow into the pan. The child, unless old enough to understand what is required, will have to be watched.

Demonstration 58

Making Throat Cultures

Requisites.—A tube containing a sterile swab and a tube containing culture medium[1] for each pupil, a tongue depressor[2] and bag for its reception after use. The pupils should act as subjects.

The preparation of most cultures is done by doctors, or by nurses specially trained for laboratory work, but

[1] This is usually blood-serum solidified with gelatin or agar agar.

[2] This is not often needed but it is always better to have it at hand.

any nurse is likely to be asked, and is expected to know how, to prepare a throat culture.

Three particularly important points to remember when doing so are: (1) That the culture will be valueless if it becomes contaminated with organisms other than those in the throat, and, therefore, everything used must be sterile and kept sterile; (2) dried or liquefied medium is not to be used; (3) when a throat culture is required, an infection, frequently diphtheria, is suspected and thus the swab used to secure the culture and tongue depressor are likely to infect anything with which they come in contact and, possibly, with a very serious virus.

The following directions are copied from a pamphlet provided by the New York City Department of Health:

"Place the patient in a good light and, if a child hold it.[1] In cases where it is possible to get a good view of the throat, depress the tongue and rub the cotton swab gently, but freely, against any visible exudate, revolving the stem of the swab between the fingers, so as to bring all portions of the cotton in contact with the mucous membrane or exudate. In other cases, including those in which the exudate is confined to the larynx, pass the swab back as far as possible; avoid touching the tongue with the cotton, and rub the latter freely, in the manner just described, against the mucous membrane of the pharynx and tonsils. Withdraw the cotton plug from the culture tube, holding it so that the portion withdrawn from the tube will not come in contact with the fingers or any other substance.[2]

[1] If the child is small it should be restrained as described, page 332.

[2] Take hold of the portion of the swab protruding from the tube between the third and fourth fingers of the right hand in such manner that, when the plug is withdrawn, the part that was in the tube will project behind the fingers; hold it thus until you reinsert it.

Insert the swab and rub it gently, but thoroughly, back and forth over the entire surface of the serum. At least half a minute should be given to this operation, the stem being revolved so as to bring all portions of the cotton of the swab in contact with the surface of the serum, but do not push the swab into the serum nor break the surface of the latter in any way. Then replace the swab in its own tube. Plug both tubes. Mark the culture tube with the name of the patient, etc."

CHAPTER XI

Enemata. Colon Irrigation

The nature and purposes of enemata. Precautions necessary in their administration. Equipment and procedure.

An enema (plural enemata) is an injection of liquid into the colon through the rectum.

The principal purposes for which enemata are used are: (1) To induce catharsis, *i. e.*, purgative enemata; (2) to cause the expulsion of gas, viz., carminative enemata; (3) to provide the body with nutrient when it cannot be taken by mouth, *i. e.*, nutritive enemata; (4) to give drugs that are intended for absorption when they can not be taken by mouth and the dose is too large for hypodermic injection; (5) to affect local pathological conditions, *e. g.*, emollient enemata which are used to soothe irritated intestinal mucosa, antiseptic enemata, used in the treatment of diarrhea due to microörganisms, anthelmintic enemata, used to kill or cause the expulsion of worms.

Facts regarding the anatomy of the rectum that it is important to remember when giving an enema are:

1. At the anus the rectum slants forward, see Fig. 38, but, almost at once it changes its course backward and follows the contour of the coccyx and the lower part of the sacrum.

2. In the adult the rectum is from 6 to 8 inches in

length, at its upper limit, where it merges into the sigmoid flexure, there is a sharp curve, due to the projection of the sacrum. *If a rectal tube is introduced more than 6 to*

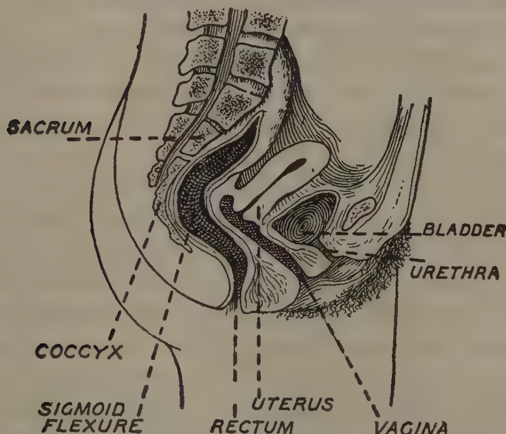

Fig. 38. Showing the curve of the large intestine above the rectum and the relative position and shape of the bladder, uterus, rectum, sigmoid flexure, coccyx, and sacrum

8 inches, according to the size of the individual, it is likely to strike against the projection of the sacrum and become coiled in the rectum.

3. Ordinarily, much of the tissue of the rectum is in longitudinal folds which may be considerably stretched and the diameter of the rectum is then greatly increased.

4. The rectum is plentifully supplied with afferent nerve-fibers and the endings of these are stimulated when feces or any foreign substance—as a rectal tube—enters the rectum. The impulses induced by the introduction of a rectal tube into the rectum are likely to cause contraction of the muscle tissue in the walls of the

rectum and this may temporarily impede the passage of the tube.

Other facts that must be known in order to appreciate the reasons for procedures and the nature of the material used for different kinds of enemata are:

1. Liquid that is introduced into the rectum induces strong antiperistaltic waves that force the material into and through the colon, sometimes even as far as the cecum.

2. If the liquid is introduced quickly, or if it is used in sufficient amounts to distend the bowel, or if it is of a nature to irritate the intestine, it will also induce strong peristaltic waves and defecation reflexes which will promote its expulsion. It will also increase the peristaltic activity of the small bowel. On the contrary, a bland liquid given slowly and in small amounts is likely to be retained and, if the material carried into the colon is soluble, varying amounts of it are likely to be absorbed, the absorptive capacity of the large intestine however, except for water, is considerably less than that of the small intestine.

3. The large intestine, unlike the small bowel and the stomach, is not provided with glands to secrete a digestive juice and therefore food material given by rectum must be predigested before administration.

4. The presence of much fecal matter in the intestine interferes with the passage of injected liquid through the colon and also with its retention and absorption.

5. Hard fecal matter that is impacted in the intestine can be softened if exposed to the influence of water, diluted soap solution, normal salt solution, or warm oil, for from 1 to 4 hours, the time required depending upon the density and hardness of the impaction, and glycerine increases the penetrating power of the other liquids.

Thus it can be appreciated somewhat **different methods** must be used in administering enemata according to the effect desired; *e.g.*, if an enema is to be retained it must be given slowly, the liquid must not be of an irritating nature, its temperature must be about that of the interior of the body and only a small amount of liquid can be used; on the other hand, when an enema is intended to promote peristalsis and flush out the colon, the liquid needs to be of a somewhat irritant nature, a larger amount, from 2 to 3 pints, is used and it is introduced relatively quickly. As a rule however the bowel will be more thoroughly freed of its contents if the liquid is retained for a short time (15 to 20 minutes) since a more prolonged and general peristalsis will then be induced and the feces may be softened by the water. Therefore, as a rule, the liquid is only introduced at a moderate rate and under moderate pressure, occasionally however, when an immediate evacuation is essential, it is administered more rapidly and with greater pressure. The rate and pressure are determined by the height of the reservoir holding the liquid.

Position of patient.—Formerly it was thought that, because of the curve of the sigmoid flexure, better results would be obtained if the patient were placed on her left side, but X-ray pictures have shown that the strong antiperistaltic waves excited by the entrance of the liquid carry the latter up almost as readily when the patient is lying on her back and therefore if, as is usually the case, a very ill patient is lying on her back she is seldom disturbed, further than to raise her hips on a pillow or douche pan, or sometimes the foot of the bed is elevated; the elevation puts the flow of liquid under the force of gravity which aids its passage into the bowel. To get the full force of gravity the patient is sometimes

placed in the knee-chest position. When either the dorsal or right lateral position is used the knees are flexed in order to relax the abdominal muscles and thus lessen their pressure on the intestines.

Demonstration 59

Purgative Enemata

Purgative enemata act (1) by irritating the intestinal mucous membrane and so promoting peristalsis, (2) by distending the bowel and thus stimulating the expulsive reflexes, (3) by softening feces. Irritation being one of the factors depended upon, some substance that irritates the mucous membrane (usually soap) is added to the water.

Requisites.—1. A bath blanket.

2. Something to protect the bed, usually a medium sized rubber sheet and either a crushed (but not soiled) draw sheet or a cotton bed pan cover are used.

3. A gauze compress. This is to hold against the anus if necessary to further the retention of the fluid and, after evacuation, to cleanse the parts.

4. A towel.

5. An irrigator containing the solution and connected with rubber tubing that is between 2 and 3 feet in length and supplied with a stop-cock.

6. A rectal tube with a glass connecting tube in its free end. The latter is inserted in the free end of the irrigator tubing.

7. Vaseline or other lubricant. Soap solution is sometimes used for purgative enemata, but not for other varieties.

8. A bedpan.

9. Toilet paper.

10. A kidney basin in which to put the rectal tube after use.

11. A dressing basin containing hot water. This will not be needed until after the patient has used the bedpan.

12. A standard to hold the irrigator.

13. A Chase doll for subject.

Articles 2 to 10 are placed on a tray and either the rubber sheet or draw sheet is used to cover them.

Aims.—When giving a purgative enema, a nurse should have two aims in view: (1) to get a good result, (2) to cause the patient as little discomfort as possible.

To get the best results and avoid annoying the patient unnecessarily the following precautions should be observed:

1. Avoid unnecessary exposure of the patient.

2. Protect the bed adequately from both soil and odor.

3. Lubricate the tube, but remember, a small amount of lubricant, covering as much of the tube as is to be inserted, is all that is required and, if more is used, the bedding may be soiled and it will be difficult to clean the tube; apply the lubricant with a piece of toilet paper.

4. Avoid putting air into the intestine, for it will cause useless and unnecessary distress. This will be done by (a) failure to remove the soapsud bubbles from soap solution enemata; (b) forgetting to let solution run through the tube before inserting it; (c) allowing the solution to get below the exit aperture of the reservoir while the tube is still in the rectum.

5. Do not use force when inserting the rectal tube and, to avoid the necessity of doing so, insert it slowly holding it in such position that it will follow the course

of the rectum (see Fig. 38), and using a slight boring motion; do not insert it farther than, according to the size of the patient, four to eight inches, for the antiperistaltic waves excited by the flow of the liquid into the intestine will carry the fluid onward and, if the tube is pushed, it is likely to be jammed against the sacrum or coiled in the rectum and the flow thus interfered with. If it is necessary to aid the flow do so by gravity and either raise the patient's pelvis on a pillow or douch pan or ràise the foot of the bed.

6. Regulate the flow according to the effect desired. As already stated, if the fluid is introduced quickly, it will be expelled at once and a washing out of the lower part of the bowel will probably be the only result, and, ordinarily, to get the best effects, a purgative enema should be retained for at least ten or fifteen minutes. An exception is when, especially following catharsis or an enema to soften feces, the enema is given chiefly to produce a strong expulsive effort. The rate of the flow is regulated by the height of the reservoir and a common rule is that this should be held not more than one foot above the bed when the enema is to be retained and not more than two feet for a purgative enema, except when it is necessary to induce a strong expulsive effort when it may be raised to about three feet. The reservoir should be raised to the desired height gradually and it should be lowered, or else the flow shut off, temporarily if much distress is caused by the inflow of fluid into the bowel.

7. If the patient is afraid that the tube will slip out hold it near the anus. Fear of this accident is a common cause of distress and it adds to the difficulty of retaining the injection.

8. Occasionally the rectum is so packed with feces

that the entrance of the tube and the flow of the current is interfered with. In such case put on an old rubber glove or put a finger cot on the middle or index finger, lubricate this and remove the impaction. If a rubber cot or glove is not to be had fill the space under the finger nail with soap and lubricate the finger.[1]

9. If the flow of liquid becomes checked because of blocking of the tube with feces, withdraw the tube slightly and, if this is not effectual remove it and let the liquid flow through it, then reinsert it.

10. Pinch the tube when removing it (otherwise fluid will drop on the bed) and remove it quickly.

11. After removing the tube press the gauze compress against the rectum and hold it thus until the desire to expel the fluid is lessened.

Procedure.—Gather the equipment and then prepare the solution. As previously stated, soap is commonly used. Except when very strong irritation is desired, pure oil soaps, as Castile and ivory, should be used, and not laundry soaps which nearly always contain free alkalies. The latter should not be used unless ordered by the physician. Enough soap will be needed to make a white-looking solution.[2] This, if standard soap solution[3] is used, requires about one ounce for each pint of water. Ordinarily, two to three pints[4] are required for an

[1] If an odor clings to the hand and cannot be removed by washing with soap and hot water, rub the hands with dry mustard and warm water for about 5 minutes and then rinse them thoroughly.

[2] It is a common custom in hospitals to collect all small pieces of unscented toilet soaps and keep them in either a bottle containing water enough to dissolve them or a soap-shaker, the latter is stirred in the water when the enema is prepared.

[3] A 20% solution of Castile soap.

[4] More than three pints should never be used, unless prescribed by a physician, and when a patient is getting enemata constantly

adult. The solution is usually made about 108° F. This allows for 4 or 5 degrees cooling while arranging the patient. Remove the froth; it contains air.

Take the equipment to the bedside.

Hang the irrigator on the standard.

Replace the upper bed covers with the bath blanket,[1] folding the former to the foot of the bed.

Put the rubber under the patient; it should extend from the small of the back to the knee joints, and cover the portion with which the patient comes in contact with a dressing towel or a folded draw sheet. If the latter is used, after the patient is in position, draw it up, loosely, over her legs, under the blanket.

Place the patient in position. Turn her nightgown out of the way.

Warm the tube and expel air from it by letting solution run through. Shut off the flow.

Lubricate the rectal tube; use a small piece of paper to apply the lubricant.

Insert the tube, holding the lubricated part with a piece of toilet paper (see Precaution 5). This, after practice, can be done without looking, and it is not necessary, even for the inexperienced pupil to actually expose her patient. To avoid doing this, draw back the portion of the side of the blanket that is on a line with the lower part of the pubes; all necessary inspection can be made between the folds thus made in the blanket.

Open the stop-cock.

Raise the reservoir about one foot above the patient

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only use as small an amount as possible to get results, for frequent overdistention of the intestines tends to promote obstinate constipation by accustoming the intestine to excessive distention.

[1] If the bed covers are allowed to remain over the patient, they become permeated with the fecal odor.

and raise it gradually. It is a common rule in hospitals that, except when the patient is very restless and may need restraint, the reservoir is not to remain hanging on the standard, but is to be held by the nurse, so that it will be impossible for her to leave the patient while the solution is flowing in. If distress is caused lower the reservoir somewhat or shut off the flow for a short time.

When the required amount has been given, withdraw the tube following the instructions mentioned in Precaution 10. Press the compress against the anus until desire to expel the fluid is lessened.

Place the patient on the bedpan. Encourage her to retain the enema for ten or fifteen minutes.

After the liquid, etc., has been expelled, care for the patient as described on page 152. If she is in a room, and it is permitted, open the window, taking means, if necessary, to protect her from the cold. Remove, clean, and put away the apparatus as described in Chapter III. Record the result of the enema on the chart at once.

Demonstration 60

Method of Giving Purgative Enemata to Young Children

With young children it is an irrigation, rather than an enema, that is given, for they generally either cannot or will not retain the injected fluid. Therefore, it is usually necessary to do either of three things: (1) keep the child on the bedpan during the treatment; (2) hold it in the lap; (3) place it on the edge of a table with a Kelly pad under the buttocks.

Equipment.—The same as for Demonstration 59 with the following exceptions: The draw sheet will not be needed, but if the child is held in the lap, a rubber apron and a safety pin will be; a rubber catheter is substituted

for the rectal tube; only one pint or a pint and a half of solution will be needed, and, if soap solution is used it should be only about half as strong as that used for adults, many physicians prefer normal salt solution to soap as a child's mucous membrane is very easily irritated.

Procedure.—The main differences in giving an enema to a child if it is placed on the bedpan are: The reservoir is allowed to remain on the stand, about *twelve to eighteen inches* above the child, instead of being held, for it may be necessary to control the child's movements; the catheter is inserted only about three to five inches, according to the size of the child, and it must be held in place.

If you hold the child in your lap, protect yourself with the rubber apron; turn the child's clothing above its waist and pin one end of the rubber around the latter; put the free end of the rubber in a bedpan or pail and arrange the sides to form a trough; protect and, if necessary, restrain the child with a small blanket or folded sheet; while giving the injection keep the child on its back and hold its legs flexed upon its abdomen. Proceed in the same manner if you place the child on the edge of a table, but a Kelly pad can be substituted for the rubber trough.

Demonstration 61

Enemata for which only a Small Amount of Fluid is Used

Differences in equipment and procedure for such enemata and those already described are:

1. When the enema is not given to promote defecation it is not necessary to turn the bed covers to the foot of the bed, but it facilitates matters if the blanket, doubled, is put over the trunk and the covers are turned back so

that they just overlap the lower edge of the blanket two or three inches at the groin.

2. Especially when the enema is to be retained, use a rubber catheter,[1] instead of a rectal tube, for, being smaller, it will cause less irritation. Connect the catheter by means of a glass connecting tube with rubber tubing twelve to eighteen inches in length and of one quarter of an inch bore, and unless a small irrigator can be obtained, insert a funnel in the free end of the latter. If the funnel is used, keep the liquid in a pitcher and, after lubricating the catheter, fill the funnel, allow some of its contents to run through the catheter, back into the pitcher, compress the tubing against the lower end of the stem of the funnel,[2] so as to keep some of the solution in the funnel which is never to be emptied until the treatment is through.

3. After inserting the catheter about four to five inches, wait a full minute before allowing the flow to start, maintaining pressure against the anus during this time. Do so again, before removing the catheter after all the fluid has been given, exerting pressure on the tubing in the meantime to prevent the entrance of air into the intestine.

When the enema is to be retained it is most important:

1. To remove the catheter quickly and to make firm pressure against the anus until desire to expel the liquid has ceased.

2. To keep the patient quiet.

[1] Catheters used for this purpose must be kept separate and never substituted for those used to catheterize the bladder.

[2] It is well to hold the funnel as shown in Fig. 23, with the little finger in front of the tubing, just at the bottom of the funnel stem, for by moving the finger backward and upward the tubing is pressed against the stem and the flow thus easily checked.

3. It is often advisable to raise the patient's hips on pillows before giving the enema, or, if the patient is in poor condition, to raise the foot of the bed from three to six inches, this disturbs the patient less, is more comfortable and provides almost as efficacious a position.

4. The rectum and even the colon must be free from feces. This is especially important for nutritive enemata; therefore, patients getting these are given a purgative enema daily and this should be given at least two hours before a nutritive one, so that all irritation of the intestine will have ceased.

Injections for Amelioration of Diseased Conditions of Rectum

When injections are given for action upon the rectum a short nozzled syringe should be used instead of a catheter so that the liquid may be injected where it will come in contact with the parts it is to affect. Otherwise the procedure can be carried out as just described.

Ingredients Used for Special Enemata

Anthelmintic Enemata

These, as previously stated are given to induce the expulsion of worms infesting the bowel.

Anthelmintic enemata in common use are: Infusion of quassia; limewater; solution of tannic acid, 1:2000; solution of alum, thirty grains to the pint. These enemata are given in the same manner as the purgative.

Carminative Enemata

For the so-called carminative enemata substances are used that will produce a stronger stimulation than

the ordinary soapsuds enema and thus promote forceful contractions of the intestinal muscle and the consequent expulsion of flatus.

The carminatives most commonly used for rectal administration are asafetida, milk and molasses, and turpentine.

Asafetida is used for this purpose in amounts of from 2 to 4 drams. It is sometimes prescribed to be added to purgative enemata and sometimes to be mixed with 4 to 6 ounces of either hot water or soap solution and given as a small enema to be retained as long as possible and followed by a purgative enema.

A milk and molasses enema is prepared by mixing the two ingredients and heating them to about 160° F. The amount generally ordered is 3 ounces of each of the ingredients. It is administered as a small enema and is to be retained as long as possible.

Proper preparation of **turpentine enemata** is very important, because this drug is very irritating to mucous membranes and, if allowed to separate from the other ingredients, as it tends to do if allowed to stand, it may cause blisters. Therefore the liquid for the enema must be thoroughly beaten or shaken immediately before administration. Turpentine is sometimes given in oil (about 4 ounces) as a small enema which is to be retained for an hour or two and to be followed by a purgative enema. Also it is sometimes prescribed in smaller amounts (about 1 dram) to be added to a purgative soap suds enema, or combined with other ingredients (as glycerine and magnesium sulphate solution) that have cathartic properties.

Enemata to Soften Feces

Common prescriptions are: (1) Glycerine ½ ounce to 2 ounces in ½ to 1 pint of a warm dilute soap solution.

(2) Glycerine and oil a.a. 2 ounces. An enema for this purpose is given as a small enema and, to get the best effects, the liquid should be retained for about 4 hours, when a purgative enema is given.

Emollient enemata

Emollient enemata are used to relieve irritation of the mucous lining of the colon. Starch is the emolient generally used.

To make a starch enema, mix one teaspoonful of starch with a tablespoonful of cold water. Add slowly, while stirring, two tablespoonfuls of boiling water and boil until a smooth, translucent paste is made, then add, very slowly, enough boiling water to make half a pint. Cool to 106° F. before administering.

Nutritive Enemata

Nutritive enemata, as previously stated, are used to provide the body with nourishment when it cannot be taken by mouth.

Common prescriptions are:

1. Dextrose half an ounce to eight or ten ounces of water.
2. As above substituting half to two ounces of liquid peptonoids for an equal amount of water.
3. Half an ounce of dextrose, one egg, and six ounces of milk that have been peptonized, ten grains of salt.

To prepare this enema: Dissolve two and a half grains of pancreatin and seven and a half grains of bicarbonate of soda in a little tepid water, add this to the milk, beat the egg with a fork and add it to the milk, stir the mixture, and let it stand in a pan containing water that is kept between 115° and 110° F., for at least

two hours. Just before administering the enema add the salt and dextrose.

4. The same as No. 3, minus the egg.

Three or four enemata are, as a rule, administered during the twenty-four hours and enough egg and milk for the day's use can be prepared at one time, all not required for the first enema being put in the ice-box and kept there until needed and then heated to the required temperature and combined with the dextrose and salt.

Demonstration 62

Colon Irrigation. Enteroclysis

Nature.—The treatment variously known as colon irrigation and enteroclysis consists in injecting fluid into the colon in a steady stream, under low pressure, and providing for the immediate return of all that is not absorbed.

Uses.—The more common reasons for flushing the colon are: (1) to cleanse this part of the intestine of inflammatory products, as mucus; (2) to remove the products of intestinal putrefaction or irritating substances; (3) to destroy microörganisms, *e. g.*, the ameba causing amebic dysentery; (4) to destroy and remove worms; (5) to supply the body with extra fluid, the conditions necessitating extra fluid are explained in Chapter XVII with the treatments used chiefly for this purpose.

The nature, temperature, and amount of solution used vary according to the object of the treatment. If this is to supply the body with fluid or to cleanse the bowel, either half strength normal salt solution or sodium bicarbonate solution, 5%, are commonly used; when the object

is to destroy microörganisms, a disinfectant is employed and, as a rule, to destroy worms, an anthelmintic. When absorption or disinfection is the object of the treatment, the temperature of the solution is usually between 100° and 110° F. but, when there is inflammation, a temperature of 116° F. or even 120° F. may be prescribed, for heat is often of value in this condition. When the fluid is to be absorbed, the treatment is generally continued for hours at a time; for the other purposes mentioned common prescriptions are to continue it until the solution returns clear or until four to six quarts of solution have been given.

Data to note and record.—If the treatment is given to provide the system with fluid, measure the amount of liquid used and the quantity expelled, the difference will, of course, show the amount that has been absorbed. Record this on the patient's chart. When the treatment is used in inflammatory conditions to cleanse the mucosa, record the amount of solution given before it returned clear. Especially when the treatment is used in peritonitis, or when there is any tendency to intestinal paralysis or obstruction, note and record if gas is passed or not. This can be told by the appearance or absence of gas-bubbles in the glass connecting tube.

There are several methods of giving enteroclysis. Three of those in most common use are as follows:

Method 1

Requisites.—1. A bath blanket.
2. A Kelly pad or rubber.
3. A draw sheet.
4. An irrigation stand.
5. A reservoir containing the solution with rubber

FIG. 39.—PAILS AND STANDS FOR COLON IRRIGATION.

tubing (about three feet) attached and a stop-cock on the tubing.

6. Two glass connecting tubes.

7. A piece of rubber tubing about two feet long.

8. A pail to catch the return flow and a stand or piece of rubber to place it upon.

9. A lubricant.

10. A double-channel colon-tube. This is usually prepared as follows: Take a soft rubber catheter (French) No. 20 (this is for the inflow) and a No. 36 (French) rectal tube (for the outflow). Make an extra hole in this, if, as is usually the case, it has but two, so that there will be a hole in the top and one on each side of the tube, about an inch from the tip. To make the hole, cut it with scissors and then smooth the edges with a piece of hot metal such as a cautery or knitting needle.

Put a piece of narrow adhesive plaster around, or otherwise mark, the catheter three inches from the tip and the rectal tube seven inches from the tip.

To connect the apparatus.—Put a glass connecting tube into the free end of the tubing that is connected with the irrigator and one into an end of the other piece of tubing, connect the former with the catheter and the latter with the rectal tube. See that the tubing for the outflow (that connected with the rectal tube) is just long enough to fall about one foot below the level of the patient. The length of the tube is of importance, for, if it is longer than the length required, too great suction will be caused and the intestinal mucosa will then be drawn against the holes of the tubing and interfere with the smooth flow of the current. Adjust the height of the reservoir, as a rule it is wanted about 3 feet above the patient, but if discomfort is occasioned and the return flow is very free, the indication is that the fluid is entering the intestine

under too great pressure, in which case some of it is likely to accumulate and the reservoir should be lowered. (*Accumulation of fluid in the intestine is to be avoided for it will cause discomfort and promote muscular contractions which will cause the expulsion of the fluid and, if the patient has peritonitis, may be very harmful.*)

Put the catheter in the lowest hole of the rectal tube for about an inch (see Fig. 40).

Procedure.—After the apparatus has been put together as just described place the thermometer in the solution and see that the temperature is right. Turn down the bed covers and, at the same time, cover the patient with a folded bath blanket to the level of the rectum.

If possible draw the patient to the side of the bed.

Cover the part of the Kelly pad or rubber that will come in contact with the patient with a folded draw sheet and put it under her. If possible place her in the lateral position, but the treatment can be given with the patient in Fowler's position.

Place the pail on the stand at the side of the bed.

Let some of the liquid run through the tubes to warm them and expel the air.

Lubricate the ends of the rectal tube and catheter as far as the marks. Insert them in the rectum as far as the mark on the inflow tube; then, holding the latter, gently push the outflow tube further into the rectum until the marking is reached. This removes the catheter from the tube, but inserting the tubes together causes the patient less annoyance than when they are inserted separately.

Wait a minute, after inserting the tubes, then open the stop-cock gradually and start the flow. The solution should begin to run back almost immediately, if it does not do so, shut off the inflow and see what is wrong, for, as already stated, it is most important that fluid should

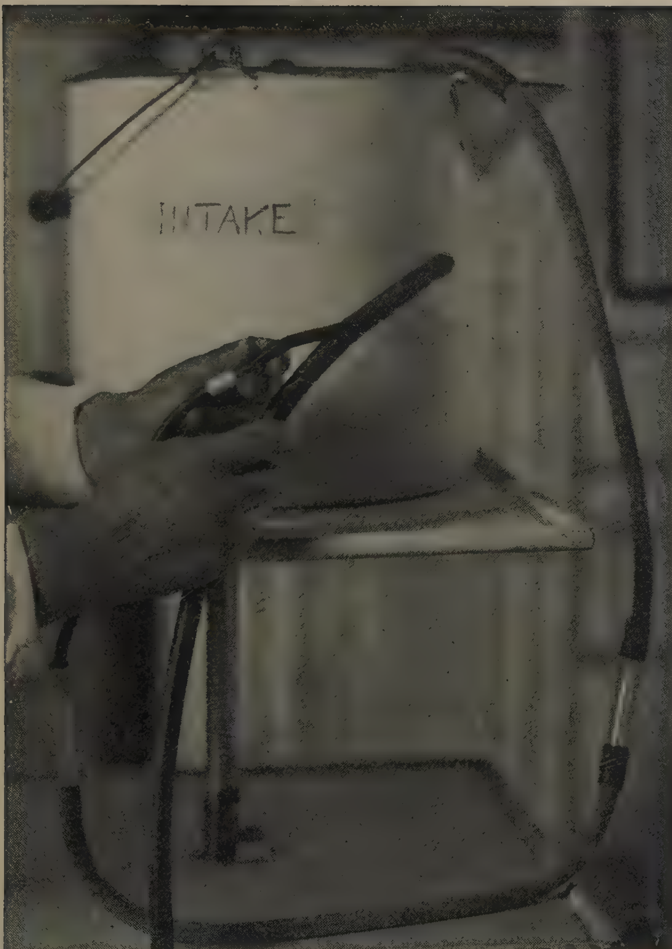

FIG. 40.—METHOD OF INSERTING A CATHETER, OR SMALL RECTAL TUBE, IN THE RECTAL TUBE FOR THE OUTFLOW.

not collect in the intestine. If there is any impaction of feces, it should be reported, an enema will probably be ordered.

If the treatment is given properly there will, after the first few minutes, be no discomfort. Remain with the patient until you are sure that everything is right. When the flow is properly started and the patient comfortable, draw up the bed covers and, at the same time, remove the bath blanket.

Especially during the first part of the treatment, inspect the glass connecting tube at intervals to see if there are air bubbles in it, in order to know if flatus is being expelled.

At the conclusion of the treatment, remove the tubes from the rectum (make pressure on them while doing so to avoid having solution drip on the bed or floor) and then wash, dry, and powder the patient's back..

Method 2

Equipment.—The same as for Method 1 with the exception of substituting two small rectal tubes of equal caliber for the tube and catheter.

Procedure.—With the following exceptions proceed as for Method 1. 1. Mark the tube for the inflow—*i. e.*, that connected to the tubing attached to the reservoir —six inches[1] from the tip (this can be done with a thin strip of adhesive plaster) and that for the outflow five inches[1] from the tip.

2. After lubricating both tubes, insert that for the inflow one inch in the rectum and then pressing both tubes together push them gently forward until

[1] For a child, mark one tube three and the other four inches from the tip.

the adhesive marks are reached. The inflow tube will then be six and the outflow five inches in the rectum.

3. The usual height for the reservoir is between twelve and eighteen inches above the patient's rectum.

Method 3

This method, for obvious reasons is rarely used when treatment is given to supply the body with fluid, except when the equipment for the other method is not to be had, but it is quite frequently employed when the purpose is to ameliorate local pathological conditions, as inflammation, and is often used instead of an enema when, for any reason, it is undesirable to cause much distention of the intestine.

Equipment.—1. A funnel (one with a capacity of 1½ pints is to be preferred and the lumen of the stem should be half an inch in diameter).

2. Tubing, about one third of an inch in diameter and two feet in length, attach this to the funnel.

3. A glass connecting tube; put one end of this in the tubing.

4. A medium-sized rectal tube with two holes, mark it six inches from the tip, insert the free end of the connecting tube in it.

5. A lubricant.

6. A Kelly pad or rubber.

7. A dressing towel.

8. A pail and a rubber to stand it upon in order to protect the floor.

9. A bath blanket.

10. A thermometer.

11. Pitchers of solution. The number depending upon the amount of solution required. It is better to

FIG. 41.—APPARATUS FOR COLON IRRIGATION IN PLACE BY THE BED.

have several pitchers of a size that can be easily held (*i. e.*, that will hold about 2 quarts) rather than a very large one. The temperature of the solution that will be used last should be about 5 degrees higher than that used first.

12. A wash cloth.

13. Talcum powder.

14. If the treatment is used instead of an enema, a bedpan. This may not be required for the feces may pass from the rectum through the funnel with the return flow, but if there is much fecal matter in the lower part of the bowel it is sometimes necessary to suspend the treatment after some of the liquid has been injected until the patient has a movement of the bowels.

Procedure.—Substitute the folded bath blanket for the covers over the upper part of the body in the same manner as for Methods 1 and 2; place the patient in position and arrange the rubber etc. to protect the bed.

Lubricate the seven inches of the tube that are to be inserted.

Take the funnel in the left hand, fill it with solution and let some of the latter run through the tubing to warm it and expel the air, but do not let the funnel become empty. (A good way to hold the funnel, while doing this and during the treatment is to keep the little finger in front of the tubing, just at the bottom of the funnel stem, because by moving the finger backward, the wall of the tubing becomes pressed against the stem and the flow is thus easily checked, while a forward movement of the finger at once allows the current to continue.)

Check the flow.

Insert the rectal tube about six inches or, for a child, about four inches.

When the tube is in place, wait a moment for the

patient to become accustomed to its presence and then, holding the funnel between twelve and eighteen inches above the patient, fill it and allow about one pint of solution to flow slowly into the intestine (*do not allow the funnel to become empty for this will interfere with siphonage*) then, quickly lower, and invert the funnel over the pail.

When the solution ceases to flow back, compress the tubing against the funnel stem, so that air will not enter the former, then turn up the funnel and fill it as quickly as possible; release the check and proceed as before. Continue the process until the required amount of solution has been used.

At the completion of the treatment, care for the patient as after Method 1 and do not forget to make pressure upon the tube while removing it.

Nov-14

CHAPTER XII

Douches

The requisites for and methods of giving spinal, vaginal, intra-uterine, nasal, throat, ear and eye douches.

By a douche is meant a stream of water directed against a part. Both the outer surfaces of the body and the cavities connecting with it are so treated.

External Douches

The effects of douches applied to the exterior of the body, like those of baths, are obtained by the stimulation of nerve endings affected by cold or heat plus those stimulated by the percussion of the water thrown upon the body. The results of such stimulation were discussed in Chapter IX.

The most common purposes for the use of such douches in therapeutics are the invigoration of the nervous system and improvement in the general tone and nutrition of the body.

The back is the most common site of treatment and constitutes the so-called *spinal douche.* To get the best effects from such douches appliances such as are used in hydrotherapy departments are required, but as the means of using these depends upon the variety, and is so much more easily explained and understood with the apparatus at hand, only suggestions for giving such a douche in the

home or a hospital where there is no regulation apparatus will be considered here. Whatever the apparatus used, the same precautions are necessary as for baths.

Demonstration 63

Spinal Douche When the Patient is not Confined to Bed

Equipment.—1. A foot tub three-fourths full of water about 112° F.; stand this in the large bath tub, near the head.

2. A piece of board about twelve inches wide, slightly longer than the width of the tub, and strong enough to hold the patient; place this across the tub, near the head, or a stool that will stand in the tub can be substituted.

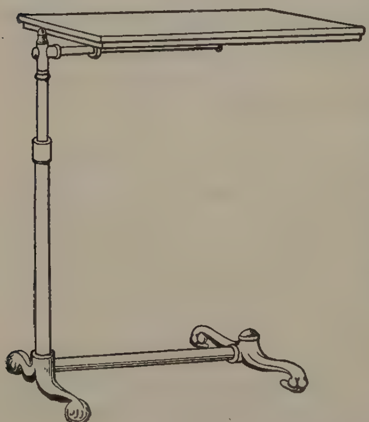

Fig. 42. Type of table that can be used for Demonstration 63.

3. A small pillow protected with a rubber case under the white; put this on the board or stool.

4. An adjustable bedside table.

5. A bath spray; attach this to the faucet.

6. A bath blanket.

7. A bath towel.

8. A safety pin.

Procedure.—Put the blanket around the patient with the opening at the back.

Undress the patient and have her sit on the board with the pillow under her, her back toward the faucet, and her feet in the foot tub.

Arrange the blanket so that the patient's chest and thighs are covered and her back well exposed. Pin it at the neck to keep it in place.

Place the table with the shelf across the tub so that the patient can lean forward and rest her arms on it if she wishes to.

Attach the spray to the water faucet.

The method of giving the douche varies. A common prescription is to spray the back with water as hot as it can be borne (*test the temperature on your own arm*) for from 1 to 3 minutes, and to follow this with water the temperature that it comes from the cold water faucets for about 5 minutes, but the time prescribed varies considerably. Another method is to alternate the use of hot and cold water, using the hot water for about 2 minutes and then the cold for a similar length of time, and then the hot again, and so on for the length of time prescribed.

Dry and dress the patient and put the equipment away. The patient should lie down or at least remain quiet for an hour or more.

Spinal Douche When the Patient is Confined to Bed

This is given in the same manner as a spray bath, described in Chapter IX., except that (1) the patient lies prone or on her side, (2) is covered, except her back, with a bath blanket, (3) the water is not kept in the *bath*, on the contrary, every means is taken to facilitate its free flow into the bucket placed on the floor at the foot of the bed, and (4) only the back is sprayed.

Douches for Body Cavities

The common aims in douching body cavities are: (1) To cleanse them; (2) to relieve congestion or in-

flammation; (3) to check hemorrhage; (4) to disinfect the cavities.

The accomplishment of these aims is dependent upon: (1) The mechanical cleansing effect of the running water; (2) the effects of heat or, occasionally, cold; (3) the action of the drug in the solution, this may be either astringent, antiseptic, soothing or detergent and many of those used have two or more of these qualities.

To understand the conditions in body cavities which, ordinarily, occasion the need for cleansing douches (other than used to prepare the parts for operation) it is to be remembered that the cavities continuous with the exterior of the body are lined with mucous membrane and this, under the influence of irritation, usually becomes congested and its secretory cells unduly active. As the result of these conditions, there is likely to be an increased exudation from the blood-vessels and an excessive secretion of mucus. If the irritation is due to pyogenic bacteria, there is also likely to be pus present; *i. e.*, the discharge will be muco-purulent. The amount of discharge is one of the most important indications of the severity of many pathological conditions of body cavities and thus it is very essential to note and record this as definitely as possible.

Demonstration 64

Vaginal Douches

Five facts regarding the structure of the vagina and uterus that should be borne in mind when giving vaginal douches (much of the technique being based upon these) are: (1) The vagina curves backward except at its upper extremity where it follows the contour of the cervix, see Fig. 38; (2) its posterior wall is about two and a half to

four inches in length and its anterior two to three inches; (3) the neck of the uterus projects into the vagina, see Fig. 38; (4) the interior of the vagina, like that of most organs that are capable of distention contains many folds or ridges in which discharges can collect; (5) normally, the walls of the cervix, particularly at the external os, are in close apposition, but, especially after a woman has borne children, in pathological conditions they may become so much relaxed that, if liquid is injected with force, discharges can be washed into the uterus.

Solutions commonly used for vaginal douches are:

Acetic acid 1:50 of 6% (for checking hemorrhage).

Bichlorid of mercury 1:3000 to 1:10,000.

Boric acid 1:25 to 1:50.

Carbolic acid 1:120 to 1:200.

Creolin 1:400.

Chlorinated soda 1:300.

Green soap 1:75 (sometimes used when preparing for local operations).

Iodine 1:200 of 7% tincture.

Lysol 1:400.

Normal saline solution.

Sterile water.

Silver nitrate 0.1–1.0%.

The usual temperature for a cleansing douche is 110° to 115° F.; for one used to relieve inflammation 115° to 118° F.; to check hemorrhage 120° F.

The quantity generally used is from two to three quarts.

Equipment.—1. An irrigator stand.

2. A bath blanket.

3. Two sterile dressing towels.

4. A douche can with a rubber tubing attached and a stop-cock on the tubing.

5. A douche nozzle. A glass catheter is sometimes substituted when giving a douche after perineorrhaphy has been performed.

6. Cotton balls or gauze sponges, two will be enough if there is not a purulent discharge, in the latter case three or four will be required and, if the discharge is very profuse, also a dressing basin containing an antiseptic solution, this may be either the same as that used for the douche or a hot 1% green soap solution.

7. A receptacle for used sponges.

8. A thermometer.

9. If necessary a vulva pad and dressing (these must be sterile if there is a wound in the area) and sterile forceps.

10. Rubber gloves if the patient has a purulent discharge or following operations on the genitalia, in the latter case the gloves must be sterile.

11. A Chase doll for subject.

Preparation of the apparatus.—Sterilize the douche nozzle by boiling for 5 minutes and, after operations of the genitalia,[1] the douche can and tubing, otherwise it is generally considered sufficient preparation to fill the can with hot water and let this run through the tubing. Collect the unsterile articles.

Put the receptacle for soiled sponges on the tray of the douche pan. Stand the douche can in the pan and cover its top with a towel. Arrange the tubing so that it will not be dragged upon.

Examine the douche nozzle to see that it is smooth and

[1] Whenever there is a wound from any cause exactly the same aseptic care must be exercised as when caring for wounds in any other locality; in fact wounds in these parts are particularly readily infected and infection is likely to be followed by very serious consequences.

intact and place it with the sponges between the folds of a sterile towel. Put this on the tray of the douche pan.

General instructions.—Be sure that the temperature of the douche is accurate, this is especially necessary when very hot ones are required.

Do not give a douche when a patient is menstruating unless ordered by the physician.

Always have the patient in the recumbent position with the pelvis higher than the shoulders which are to rest flatly on the bed. It can be easily appreciated that this position will favor the flow of the fluid to the upper part of the vagina and around the cervix.

Hang the douche can with its lower opening not more than two feet above the level of the mattress. There are two important reasons why the can should not be higher, one has been already given, see page 393, the other is that the effect of heat is usually one of the most desired objects of the douche, and, if the solution is allowed to run in quickly, the parts will not be subjected to the treatment long enough to get full benefit, unless so much solution is used that the giving of the douche is greatly complicated.

Before inserting the douche nozzle in the vagina be sure that the external genitalia are free from discharge.

Be careful not to touch the part of the douche nozzle that is to be inserted nor to let it come in contact with anything unsterile. Always examine it before use to see that it is not rough or cracked.

Have the patient remain quiet for at least an hour after a douche.

Procedure.—Carry articles to the bedside and screen the patient.

Hang can on standard.

Replace upper bed covers with a bath blanket or a sheet, fanfolding the covers to the foot of the bed.

Remove the pillows from under the head, place one under the lower part of the back.

Flex the patient's knees and see that her feet are placed firmly on the bed.

Put a folded towel over the tray of the douche pan, keeping it away from the inner ridge so that it will not get wet.

Put one hand under the patient's buttocks and help her rise; place the pan under her with the parts that are to be douched over the opening of the pan. Put the pillow against the back ridge. A rubber is sometimes placed under the pan, but this makes it more difficult to move the pan and it is not necessary for only through carelessness will the bed become wet when giving a douche.

Drape the lower corners of the blanket or sheet covering the patient around the legs as for a pelvic examination.

Let enough solution flow through the tubing into the douche pan to warm the former and expel air. If necessary put on gloves. Then let the solution flow over the vulva, separate the labia if necessary, if all discharge is not washed off with the current, remove it with sponges.

Clamp the tubing and insert the douche nozzle in its free end.

Insert the nozzle gently beyond its holes, in the vagina slanting it backward, start the current.

From time to time move the nozzle in the vagina so that all parts of the cavity and of the external wall of the cervix will be subjected to the solution.

Shut the stop-cock before the solution reaches the exit

of the reservoir. Remove the nozzle. If the patient has a purulent discharge, put the tip in the receptacle with the soiled sponges and be sure that it touches nothing else until it is sterilized.

Dry the patient thoroughly.

Steady the pan with one hand while with the other you help the patient rise from the pan. Dry her back with the towel if necessary.

Remove the pan.

Put on a vulva pad if required.

Make the patient comfortable. She should remain quiet, in the recumbent position (with one or two pillows under her head, if desired) for at least an hour after the treatment.

Remove the apparatus and care for the various articles as described in Chapter III.

Demonstration 65

Douche of External Genitalia

Purpose.—To cleanse parts after urination or defecation following perineorrhaphy, curettage, trachelorrhaphy, childbirth, or abortion.

Requisites.—Tray containing:

1. Jar of sterile cotton balls.

2. Sterile dressing basin containing sterile cotton balls in the prescribed solution (this is only needed if there is a discharge or after defecation).

3. Sterile graduate containing about 500 c.c. of warm sterile water and covered with a sterile towel.

4. 2 sterile forceps in a sterile towel or solution.

5. Sterile vulva pad.

6. Paper bag.

7. Douche pan.

Procedure after urination.—Remove the vulva pad and place it at one side, if it is not soiled or contaminated it can be used again.

Place patient on douche pan.

Fold back the upper bed clothes, except the sheet, drape the latter over the thighs.

Pour the sterile water from the measure over the parts. Hold the pitcher about 18 inches above the patient while doing so.

With sterile forceps take cotton balls from jar and dry parts carefully by patting and using a downward stroke, use a fresh ball for each stroke. Keep one pair of forceps sterile for taking balls from the jar. Put soiled balls in the bag.

Remove douche pan, replace pad if clean, if not take a fresh one.

Make patient confortable and remove equipment.

When there is a discharge and after defecation, before the irrigation, wash the parts carefully with solution, always use a downward stroke.

Chart the hour at which each douche is given, the color and approximate amount of discharge. Report and chart if there is redness, swelling, pus forming around stitches, or if stitches have begun to cut.

Demonstration 66

Intra-Uterine Douches

Purposes.—To check inter-uterine hemorrhage; to remove foreign matter.

This treatment, except in emergency, is given by the doctor, for it is not an easy matter to insert the

nozzle into the uterus and, if the uterus is in a diseased condition, its walls might be punctured by unskillful manipulation of the nozzle. Thus, as a rule, the nurse's duties consist in preparing the patient and apparatus and being ready to assist the physician as required.

The points to be especially remembered are:

To maintain the strictest asepsis, for the slightest break may be followed by disastrous results.

To cleanse the vagina as though preparing for operation on the genitalia. This includes a vaginal douche.

To arrange for thorough illumination of the vagina.

To have the temperature of the solution accurate. The usual prescription is 115° to 118° F.

To prevent the entrance of air into the uterus by (1) forcing it from the tubing before inserting the nozzle in the vagina, and (2) shutting off the current before the solution reaches the lower opening on the reservoir. This is particularly important following parturition as then air can very easily be forced into uterine blood-vessels.

Equipment.—(The articles required for the preliminary cleansing and vaginal douche should be kept separate from those needed for the intra-uterine irrigation.) The former are the same as those used for the preceding demonstration minus the douche pan if the patient is placed on the Kelly pad for the douche, as she usually is if it is given just before the intra-uterine one, and plus:

1. Sterile dressing forceps.
2. Laparotomy stockings.
3. A sheet.
4. A Kelly pad and pail.

For the intra-uterine douche there will be needed.

1. The irrigator containing the solution[1] with tubing supplied with a stop-cock, attached.

2. A bi-valve speculum, this, after being sterilized, is generally placed in a sterile dressing basin containing lysol solution 1 :400, this serves to lubricate the speculum.

3. Dressing forceps.

4. An intra-uterine douche nozzle.

5. Scissors.

6. A tube of sterile gauze packing.

7. Gauze sponges.

8. Four sterile dressing towels other than those required for covering the apparatus and tray.

9. Sterile apron and gloves for the doctor and one assistant.

10. Unless there is a good light, an electric droplight.

11. A Chase doll for subject.

Preparation of patient[2]: As a rule, in a hospital, the patient is placed on the table used for gynecological treatments. If this is not used, unless the patient is in bad condition or is having a hemorrhage, when moving her might be dangerous, she should be placed across the bed and arranged as described on page 337.

Except in emergency, put on laparotomy stockings. Drape the sheet around the patient as described page 338, and cover her chest with a folded blanket.

Place the Kelly pad under her and arrange its drain in a pail.

Wash the vulva with hot, sterile green soap solution, ¼% (hold the sponges used for the purpose with sterile

[1] The solution used must be prepared with sterile water. Acetic acid 1 : 50 is very commonly used to check hemorrhage and normal saline for other purposes.

[2] There should, if possible, be two nurses to prepare for and assist with this treatment; one for sterile and the other for unsterile work.

dressing forceps), and follow the washing with a vaginal douche. All solutions, sponges, and apparatus with which they come in contact are to be sterile.

Surround the parts exposed with sterile towels. Avoid all unnecessary exposure.

As, for obvious reasons, it is not possible to teach this treatment further than the preparation for it, by demonstration, nurses must pay special attention when assisting doctors so that, if an emergency arises, they will be prepared to give it. The most probable necessity for nurses doing so will be to check hemorrhage following parturition and then, as the cervix is dilated, it is comparatively easy to give the treatment, though the dangers of injury to the uterus, infection and driving foreign matter, as blood-clots, into the tubes, is as great as at any other time and in addition, there is the peril, unless care is taken, of forcing air into the uterine vessels and thus causing death by embolism.

To obviate these dangers.—1. Use absolutely no force when introducing the nozzle. Direct it so that it goes backward at first and then forward. The reason for this will be seen by looking at Fig. 38. When the cervix is dilated, a vaginal douche nozzle can be used.

2. Hang the reservoir with its lower opening not more than twelve to eighteen inches above the mattress.

3. Be most careful of your aseptic technique; if there is hemorrhage there may be no time for the preliminary cleansing of the vagina, but, as the parts will have been prepared for delivery, this will not be as necessary as usual.

4. Guard against the entrance of air as directed on page 399.

Massage the abdomen over the fundus with one hand while you give the douche.

The after-treatment of the patient is the same as following a vaginal douche.

Demonstration 67

Nasal Douche

The purposes of the nasal douche are to cleanse the nose and nasopharynx of discharges and crusts and lessen congestion of these parts.

The fluid is introduced through one nostril, flows through the connected nasal cavity and posterior naris, and some of it (entering through the other posterior naris) flows out through the opposite nasal cavity, while some of it passes, via the nasopharynx, through the mouth.

There are **two dangers** connected with the treatment, viz., (1) the introduction of infective material into the sinuses in the frontal, maxillary, and ethmoid bones; (2) the introduction of virus into the middle ear.

The common reason for transmission of infection to the sinuses from this cause is the too forceful striking of the liquid against the walls of the cavities and this is generally the result of the irrigator being hung too high or of the too forcible injection of the liquid with a syringe or atomizer.

To understand how trouble in the middle ear can result from a nasal douche, it must be remembered that a small trumpet-shaped tube—the Eustachian tube—extends from each middle ear and opens into the side wall of the nasopharynx. The pharygeal opening is closed the greater part of the time by the soft tissue of the pharynx, but every time a person swallows the tissue around the opening is withdrawn and material from the

throat is then easily forced into the tubes. Coughing, sneezing, and the like while a nasal douche is being given, is likely to force material into the tubes.

Coughing will be induced if the solution used irritates the mucous membrane or if liquid enters the larynx.

The precautions necessary to prevent bad results from nasal douching are: (1) To have the solution about 110° F. (*cold solutions are irritant*); (2) to use a solution with a specific gravity that will not irritate the mucous membrane—sodium chloride, or borax, or sodium bicarbonate, one dram to each quart of water, is commonly used; (3) the solution must not be allowed to enter the nose with force; (4) the head must never be bent backward during the irrigation, but must be flexed forward, with the chin nearly touching the chest (*this prevents the liquid entering the larynx*); (5) the patient must be cautioned to breathe through the mouth during the treatment and not to make the slightest attempt to draw the liquid through the nose nor to swallow, and the mouth must be kept wide open; (6) if the patient wants to cough, or blow the nose, the flow of liquid must be checked temporarily and she must be cautioned to blow her nose without closing either of the nostrils, the nose must not be blown in the usual manner until, after the treatment is completed, all the excess liquid has been expelled. (7) If the congestion is pronounced, the physician generally orders the nose to be sprayed with adrenaline or cocaine before the douche is given because these drugs cause shrinking of the mucous membrane and thus lessen danger of the liquid becoming blocked in the cavities and thereby forced against the openings leading to the sinuses, cocaine also lessens the sensitiveness of the membrane and therefore the tendency to coughing, etc.

Equipment.—1. An irrigator stand.

2. The solution; this is usually in an irrigator to which tubing, provided with a stop-cock, is attached.

3. A nasal tip. This can be dispensed with in emergency. In which case, the end of the tube is inserted in the nostril and the latter pressed upon to prevent the escape of liquid through that nostril.

4. A thermometer.
5. A basin to catch the liquid.
6. A table on which to rest the basin.
7. A small rubber.
8. A towel.
9. A safety pin.
10. A gauze handkerchief.
11. A subject.[1]

Procedure.—Pin the towel around the patient's neck and give her the handkerchief.

If she is in bed make her comfortable with pillows, preferably in a sitting position, but, if she is unable to sit up, lying on her side near the edge of the bed with the nostril in which the tip is to be inserted uppermost. Arrange the rubber so that it will protect the bedding and place the basin on the rubber in position to catch the return flow.

If the patient is out of bed, place a table in front of her, protect it with the rubber, and place the basin on this.

Hang the irrigator with its lower opening about 12 inches above the patient.

Let some solution run through the tubing into the basin.

Have the patient lean forward over the basin, with her head flexed on her chest and tilted to one side with

[1] Some of the pupils should be subjects for this and the following demonstrations of douches, for to know what these treatments feel like will give a better idea of how to administer them than can be conceived by any description.

the nostril into which the tip is to be put higher than the other. Tell her to keep her mouth open, to breathe through it, rather than her nose, and not to swallow. If the patient is old enough and not too ill, it is often better to let her hold the tip as she can then check the flow when it irritates her. If you hold it, tell her to give you a sign, as raising her hand, if she must cough or swallow (she should not attempt to speak) and check the flow as soon as she does so.

If one nostril is known to be more obstructed than the other, *e. g.*, following operation on one nostril, introduce the nozzle into the other nostril first, for the clots, etc., will be more readily washed out in this way. When the patient is not in bed, the tip is usually changed from one nostril to the other, but, as a rule, it is not necessary to make this change if the patient is in bed and cannot sit for the treatment.

At the conclusion of the douche have the patient keep her head bent over the basin for a few minutes and clear the nose of excess fluid by blowing gently through it without compressing the nostrils.

Postnasal Douche

Equipment.—A tray holding: (1) A postnasal syringe; this has a curved tip with holes on the front.

2. A pitcher containing the prescribed solution.
3. A basin.
4. A towel and a safety pin.
5. A compress or a handkerchief.

Procedure.—Pin the towel around the patient's neck.

Place the patient and basin in position as for a nasal douche.

Fill the syringe with solution and pass its point, turned upward, into the mouth behind the uvula and soft

palate until the entire curve of the syringe is hidden behind the latter. Then, after the patient flexes her head, press the piston gently. The liquid then flows into the nasal chambers and out through the nostrils.

It is claimed that this method of irrigating the nose obviates the danger of fluid entering the Eustachian tubes.

Demonstration 68

Pharyngeal Douche

Pharyngeal or throat douches are most frequently used (1) in preparation for operation upon the throat and (2) in suppurative conditions of the throat, especially when, for any reason, the patient cannot use a gargle effectively.

Purposes.—To cleanse the throat and wash away discharge; to obtain the benefit of direct application of heat or, occasionally, cold.

Equipment.—1. An irrigator stand.

2. An irrigator, containing the required solution,[1] to which tubing supplied with a stop-cock is attached.

3. A tip; a curved drinking tube is generally used. This is omitted if the patient is a child and in this case a tongue depressor and sometimes something to put between the teeth will be required. A small spool or a cork is a good substitute for a mouth gag for the latter purpose.

4. A small rubber.

5. A dressing towel.

6. A basin.

7. A gauze handkerchief.

[1] Solutions commonly used are: Boric acid two per cent.; normal saline; sodium bicarbonate one per cent. The temperature of the solution is generally between 100° and 110° F.

Precautions.—The essential precaution in giving this treatment is to prevent the solution, and with it the discharge, being swallowed or getting into the trachea. Therefore, the head is to be well flexed upon the chest, and the current stopped, temporarily, from time to time, if the patient feels that she has to swallow.

Procedure.—Hang the irrigator about 2 feet above the mattress.

Have the patient lie on her side with her head flexed on her chest.

Put the rubber covered with the towel across her chest and pin the latter around her neck.

Insert the tip in the mouth at one side; have the point reach behind the tongue, but be careful not to touch the back of the pharynx for to do so will cause gagging. Usually the tongue can be held down with the stem of irrigating tip, but if not a tongue depressor should be used.

Start the flow and let the liquid run from one side of the mouth to the other. Move the tip from time to time so that all parts of the throat will be irrigated. The liquid must flow freely from the mouth into the basin.

Demonstration 69

Aural or Ear Douche

It is the auditory canal that is irrigated in the ordinary ear douche.

Purposes.—(1) To remove foreign bodies, wax, or discharge from the auditory canal; (2) For the relief of pain and inflammation in either the auditory canal or middle ear. Such relief is usually due to the heat, but drugs are sometimes added to the solution that aid in these effects.

Important facts regarding the auditory canal to bear in

mind when giving a douche are: That the canal, in the adult, is about one and one quarter inches long, but somewhat shorter in children, and is divided from the central portion of the ear—usually termed the *middle ear*—by a membrane called the *tympanum* or *drum*. The exterior two-fifths of the canal is of cartilage, but its posterior portion is hollowed out of the temporal bone. The canal, after the first two or three years of life, curves first upward and then downward, its highest point being just about at the juncture of the cartilage and bone. For this reason, when giving a douche, it is necessary to pull the auricle upward and backward. This, as the cartilage foundation of the auricle is continuous with that of the canal, pulls the latter up above the floor of the highest portion of the canal.

In children under about two years of age, owing to imperfect development of the temporal bone, the central elevation in the canal is lacking and, therefore, when giving an irrigation, the auricle must be drawn downward and backward or merely backward.

Precautions necessary when douching the ear are: (1) Not to allow the solution to enter with force, except when there is foreign body in front of the drum membrane for the pressure of a strong current on the drum will cause pain and may even rupture the membrane. (2) To avoid irritation of the canal by the use of unsuitable solutions or by rubbing it. Irritation will not only cause pain at the time, but it is likely to excite a chronic excessive secretion of cerumen (wax) or furunculosis (*the formation of small boils*). (3) To have the solution the right temperature. Between 106° and 108° F. is the temperature commonly prescribed; anything colder than this may, when there is inflammation, induce pain that will persist for hours.

Equipment.[1]—1. The solution, between one and two pints (normal saline and boric acid are very commonly prescribed), in, preferably, an irrigator, to which about 24 inches of rubber tubing with a quarter inch bore is attached. Have a stop-cock on the tubing.

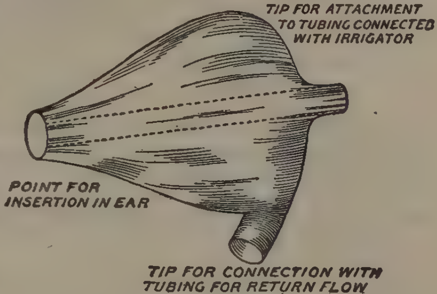

Fig. 43. Glass return-flow ear nozzle.

2. A nozzle; when the treatment is given for the removal of a foreign body or wax a straight tip is used, but when the treatment is for the relief of inflammation and pain the *return flow aural irrigating tip* and the Fowler's *ear irrigator tip*[2] are considered the best kinds. Attach about eighteen inches of rubber tubing one-quarter inch bore to the projection for the return flow. See Fig. 43. A straight tip and a syringe.

[1] When a douche is given following an operation on parts in or around the ear, the equipment must be sterile. Otherwise everything must be surgically clean but only the nozzle and the solution need be sterilized.

[2] These have several advantages over the bulb and the piston syringes often substituted: (1) When they are used the flow of solution can be so regulated that the interior of the canal will be filled during the entire treatment, but without undue pressure on the drum, for the rate of the entrance and exit of the liquid will be uniform and balanced, which is not the case when a syringe is used; (2) it is easy to keep the bedding or clothing from becoming wet, and with the syringes and a straight irrigator tip it is only possible to do so by keeping a basin pressed uncomfortably tightly against the neck under the ear because these cannot be fitted into the entrance of the canal, it being necessary to leave space there for the exit of the fluid.

3. A small rubber.

4. A dressing towel.

5. A basin large enough to hold the amount of solution used.

6. Absorbent cotton.

7. A receptable for used pledgets.

8. A standard to hold the irrigator.

Procedure when the treatment is used for the relief of pain and inflammation.—Hang the irrigator with its lower level about 12 inches above the patient's ear.

Have the patient either lie or sit with the ear to be irrigated uppermost, if she is out of bed provide a support for her to rest her head upon.

Place the rubber, covered with a towel, around the chest and pin the latter around the neck.

Put the tubing for the return flow in the basin, hold the nozzle over the latter, and let the solution run through the tubing until it is warmed and all air expelled.

Check the flow. Insert the tip of the nozzle in the ear. Start the flow.

If pain or dizziness is occasioned, lower the reservoir, for this usually results from too much pressure. If the symptoms continue, stop the treatment until you have notified the doctor.

Shut off the current before the solution reaches the lower exit of the irrigator.

Remove the basin, etc. Dry around the ear if necessary and have the patient turn her head so that the liquid will run from the ear.

Make small cone-shaped pledgets of absorbent cotton an inch to one and a half inches in length and place one, point foremost, in the ear. Change it in a minute or two and continue to do this until the ear is dry.

Differences in procedure when a straight tip is used

instead of a return-flow nozzle: (1) The point of the nozzle is not inserted closely in the ear since space must be left for the exit of the liquid; (2) a basin—a large kidney basin is best suited for the purpose—has to be held under the ear, pressed closely to the neck, to catch the escaping liquid.

When the irrigation is used for the removal of wax, etc., a straight tip is used and the fluid must enter the ear with considerable force in order to dislodge the obstruction, therefore the irrigator is placed about 3 feet above the ear.

If the obstruction consists of a substance, such as a pea or seed, that will absorb water and thus become enlarged and consequently harder to remove alcohol is used for the irrigation, because it hardens and shrinks such substances.

The procedure when irrigating the ear with a syringe is the same as when a straight tip is used on the irrigator tubing, except that the liquid is injected into the ear with the syringe. When the treatment is given for the relief of pain, etc., the pressure on the piston or bulb of the syringe must be gentle and even.

Demonstration 70

Eye Douches

Purposes.—The removal of foreign bodies or discharge from the eyes.

Important precautions to be taken when douching the eyes are: (1) Not to let the tip of the syringe, if one is used, touch the eye; (2) to avoid pressure upon the eyeball; (3) not to direct the current toward the nose for, by so doing, discharge may be washed into the lacrimal canals and nasal duct, and serious trouble result;

(4) not to use anything rough, as gauze, for wiping the eye—absorbent cotton is particularly good for the purpose; (5) to be very careful to have the percentage and temperature of the solutions accurate, for the cornea is very sensitive and easily irritated. Boric acid solution two per cent. is very commonly used for cleansing douches and the temperature is usually between 100° and 105° F.

Equipment.[1]—1. A dressing basin containing one-half to one pint of the solution, and either absorbent cotton pledgets or a bulb syringe.

2. Dry absorbent cotton pledgets; the number required will depend upon the amount of discharge present.

3. A small rubber.

4. A dressing towel.

5. An empty basin.

6. A receptacle for used pledgets.

7. Rubber gloves if the treatment is given following operation or if there is a purulent discharge.

Procedure.—Have the patient lie with the head thrown back and tilted so that the eye to be treated is slightly lower than the other in order to avoid washing discharge into the latter. If there is a purulent discharge protect the unaffected eye with a Buller's shield or an improvised substitute (see page 415).

Arrange the rubber, covered with the towel, so that it will protect the clothing or bedding and place the empty basin where it will catch the escaping solution.

[1] When the treatment is given following operation or injury associated with abrasion, everything used for the treatment, except the protecting rubber and the receptacle for the pledgets, must be sterile; otherwise they must be scrupulously clean, but need not necessarily be sterilized.

Wash off any adherent discharge from the lids with pledgets moistened with solution (never put a used pledget back into the solution).

Separate the lids by making traction with the thumb and first finger of the left hand upon the flesh above and below the upper lids, exerting all necessary pressure while doing so upon the frontal and malar bones, *never on the eyeball.*

Squeeze the solution over the eye from the syringe or pledgets, taking the precautions mentioned on page 411, and do not let the current fall with force upon the eyeball. During the treatment have the patient at times look, alternately, upward and downward, by moving the eyeball, not the head.

When the discharge is thick or tenacious it is very apt to adhere to the membrane of the cul-de-sacs (*the folds of membrane at the junction of the ocular conjunctiva—that covering the anterior surface of the eyeball—and the palpebral—that lining the eyelids*) and it is most important that this be removed for, if allowed to remain, the contained bacteria are likely to injure the conjunctiva and cause ulceration. The lower cul-de-sac is easily inspected by placing a finger on the skin below the lid and making downward traction and, if necessary, pulling the lashes forward; it is also easily cleansed by, while the lid is drawn down, making the patient look upward (by moving the eyes, not the head) and squeezing the solution from a pledget in such a manner that it falls into the cul-de-sac. If the discharge is not all washed off by this irrigation remove it with a moist pledget, do this very gently, however, for the conjunctiva is easily injured. The upper cul-de-sac is not so easily cleansed, for the upper lid must be everted and this is not an easy matter when the latter is swollen. For this reason pupil nurses

should practice everting this lid on themselves and each other until they become proficient. To evert the upper lid catch the lashes of the lid between the thumb and first finger and pull the lid away from the eye and then press downward with the finger above the cartilage that stiffens the margin of the lid, by doing this the under surface of the lid is exposed. Then, to cleanse the under surface of the lid and cul-de-sac tilt the patient's head backward and squeeze solution from a pledget over the exposed surface. If the discharge cannot all be removed in this manner wipe away that remaining with a moistened pledget.[1]

At the conclusion of the treatment dry the eye by very gently patting with a pledget and dry the face with the towel.

A douche with an eye-bath.—This form of douche can be used only by adults and children who are old enough to manipulate the bath as directed. It is not suitable for use when there is suppuration, but it is very commonly used as a means of subjecting the eyes to the influence of a medicated lotion for the relief of non-suppurative conjunctivitis and congestion due to eye strain or irritation from external causes.

Equipment.—1. An eye-bath, about three-quarters full of the prescribed solution. (*The eye-bath is a small oval cup that will fit around the eye.*)

2. A towel and safety pin.

Procedure.—Pin the towel around the patient's neck, give her the cup and instruct her to (1) bend her

[1] If the eye is very much swollen it will be necessary to raise the upper lid with a lid-retractor, but, unless a nurse has had special training in the treatment of the eyes, she should not attempt to do this until shown how by the physician, for unless it is done properly serious damage may be done.

head forward and press the cup firmly around the eye, keeping the eye closed while doing so, and (2) pressing the cup in place, to throw her head backward and, for the length of time prescribed, which is usually two to five minutes, to keep alternately opening and closing her eye and moving the eyeball; (3) to bend her head forward and remove the glass.

To improvise a Buller's shield for the protection of one eye when the other is diseased:

Take a watch crystal, about 1½ inches in diameter, and two pieces of adhesive plaster, one 2½ and the other two inches square, make a hole one inch square in the center of the smaller piece and about half an inch to one side of the center in the larger piece. Paste the smaller piece of plaster to the margin of the concave side of the crystal and the larger to the convex side and the two pieces of plaster to each other. The larger piece will extend half an inch beyond the smaller except at one side. Place the crystal over the eye, concave side downward, with the side where there is no free adhesive material at the outer side of the face. Stick the adhesive to the face above and below the eye and around the nose. It is left free at the temporal side of the face to allow for ventilation of the eye. If the shield is to be worn continuously, it should be removed twice daily and the eye washed. Never use anything that is used for the other eye for this purpose.

CHAPTER XIII

Lavage, et cetera

Lavage of the stomach. Expression of the stomach's contents. Duodenal expression and flushing. Gastric and nasal gavage. Gastrostogavage.

Demonstration 71

Gastric Lavage

The term lavage signifies the washing out, douching, or irrigation of an organ. It is used more especially for the washing of the stomach.

The purposes of the treatment are: To cleanse the stomach of mucus, to relieve congestion, to remove poisons or irritating matter that is causing nausea.

Requisites.—1. A stomach tube,[1] eighteen inches of which are to be in a basin containing ice,[2] the tube being coiled around the ice.

2. Rubber tubing about eighteen inches in length with a funnel in one end and a glass connecting tube in the other; the latter is also inserted in the open end of the stomach tube.[3]

[1] A soft rubber catheter (about No. 16 American or No. 24 French) is used instead of a stomach tube for a small child.

[2] The cold hardens the rubber and facilitates the passage of the tube.

[3] Some stomach tubes are long and have a rubber funnel attached: if such is used these articles will not be required.

3. A pitcher containing water or the solution prescribed; this is very frequently either boric acid, two per cent., or sodium bicarbonate, five per cent. The temperature usually prescribed is 105° F.; from one to two quarts are generally used.

4. A rubber apron or a rubber sheet and safety pin.

5. A towel.

6. A gauze compress which is to serve as a handkerchief for the patient.

7. A little glycerin to lubricate the tube and a square of paper or gauze sponge to apply the lubricant (*a lubricant may not be necessary when a patient is accustomed to the treatment*).

8. A kidney basin, this will be needed if, as sometimes happens, the patient vomits.

9. If the patient is likely to resist the passage of the tube something to put between the teeth will be necessary; this may be a mouth-gag, a small roll of bandage, or a cork.

These articles should be carried to the bedside on a tray, and covered with a towel.

10. A pail and a small rubber to put under it to protect the floor.

Points to be remembered.—1. Before starting the treatment, it is most important to reassure the patient and to instruct her to make the motions of swallowing as the tube goes down the esophagus and to breathe naturally; for, if she does so, the passage of the tube is an easy matter while it is very much the reverse if she struggles.

2. Unless specially ordered or in emergency, lavage should not be performed within three hours after a meal.

3. Do not hold the funnel more than three or four inches above the patient's mouth for the liquid is not to be introduced into the stomach with force.

4. When introducing the tube avoid striking the posterior wall of the pharynx, for this will gag the patient.

5. Do not push the tube forcibly, great harm might be caused were it driven against the walls of a diseased stomach.

6. Do not allow the funnel to become empty except while it is inverted for siphonage, for, if it does, siphonage will be interfered with.

7. If there is any obstruction to the passage of the tube, or if gastric pain is caused by the introduction of the fluid, or if there is any sign of blood in the siphoned liquid, discontinue the treatment until you have reported the fact to the head nurse or doctor, for in certain diseases, as carcinoma or ulcer of the stomach, a dangerous hemorrhage might be caused.

Procedure.—Wash your hands. The treatment can be given with the patient either sitting up or in bed. If she is in bed move her to the edge, and make her comfortable with pillows, in, unless conditions contra-indicate, a semi-sitting position, otherwise lying on her back, the head is to be tilted very slightly forward.

Put one end of the towel over the upper border of the rubber apron and tie the latter around the patient's neck; at the same time, if she has on a collar, remove it and see that her clothing is loose around the neck.

If she has false teeth on a plate remove them.

Place the pail, with the rubber under it, on a chair or the floor in position to receive the siphonage.

Put the funnel open end down on the table and expel the air as well as possible by, if there is not a pump on the tube, stretching and squeezing the tubing (*it is not usually expelled by filling the tubing with water, as when giving an enema, because if the patient resists, some of the water in the tube may get into the trachea*).

Lubricate the tube with glycerin. Do not use much and never use oil as this would be likely to cause nausea. When the patient is accustomed to the passage of the tube no lubricant is necessary, the mucus in the throat being sufficient, but if a person is unaccustomed to the treatment the throat may become very dry, as the result of nervousness, and this interferes with the passage of the throat.

Give the patient the gauze handkerchief and place the kidney basin where she can reach it easily.

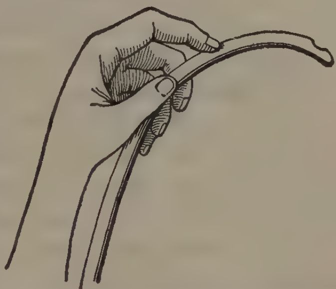

Fig. 44. Method of holding lavage tube curved so that it will not strike wall of pharynx.

Stand on the right side of the patient and, if her head is not otherwise supported, somewhat behind her so that you can support her head with your left arm while you introduce the tube. Take the latter about three inches from the tip and, holding it somewhat curved, so that it may follow the curve of the palate and thus avoid striking the back of the throat, insert it gently, keeping it just above the tongue; tell the patient to swallow as soon as it reaches the back of the throat, insert it until the circular mark, which is eighteen inches from the tip, is at the teeth.[1] Have the patient bend her head slightly forward that the extra secretions incited by the irritation of the tube may run out of her mouth.

Then fill the funnel with water, do this the instant you turn the open end upward, raise it about six inches above the patient, and allow the water to flow in slowly; when

[1] Not quite so far as this for a child or very small adult.

the funnel is half empty refill it. Keep track of the quantity used. When about a pint has been given, while the funnel is still half full, quickly lower and invert the latter so that the fluid will siphon back. If it fails to do so pour a little more into the stomach and as you lower the funnel tell the patient to press upon the abdomen and contract the abdominal muscles.

Almost as much liquid should return as was given; when it begins to flow slowly, turn the funnel and fill it quickly so that the tube will not become filled with air Repeat the process until the required amount of solution has been given. A common prescription is that the treatment should be continued until the solution returns clear of mucus.

Pinch the tube when removing it and remove it quickly. Put the tube and funnel in the basin and release your pressure on the tube.[1]

Make the patient comfortable and remove the apparatus.

Record the time that the treatment was given, the nature and amount of solution used, the character of solution first returned, and how much liquid was used before it returned clear.

Demonstration 72[2]

Expression of the Stomach's Contents

The contents of the stomach are sometimes removed by inserting a tube into the stomach and extracting the

[1] If you do so sooner the water in it may flow on the floor or the patient.

[2] This procedure is usually performed by the doctor and only the arrangement of the apparatus can be demonstrated, but the nurses must understand the nature of the procedure in order to give efficient assistance.

air from the tube by means of a stomach pump, Politzer bag, or syringe. This will have the desired effect because, when the air in the tube is extracted the pressure within the tube is nil—*i. e., there is a vacuum*, and the pressure within the stomach will then force the contents of the organ through the tube. This procedure is commonly termed gastric expression.

Purposes.—Expression is sometimes performed, instead of lavage, for the removal of poisons, etc., from the stomach, but it is more commonly used (generally in connection with "test meals") as an aid to diagnosis. The principal conditions determined in this way are: (1) the reaction of the gastric juice and (2) the degree of the motor and secretory activity of the stomach. Diagnosis is based upon the amount of material extracted and the findings by chemical analysis of the degree of digestion that the material has undergone and the presence or absence of foreign substances.

Test meals consist of specified foods of which the time required for digestion has been positively determined: the ones most commonly used are described in Chapter VIII.

Requisites for Expression.—(1) A stomach pump[1] or a stomach tube and a large syringe or Politzer bag. The point of the syringe or bag must fit the opening of the stomach tube very closely since the connection must be air tight. The eighteen inches of the stomach tube to be introduced should be coiled around ice in a basin.

2. Glycerine to lubricate the tube and a small gauze sponge with which to apply the lubricant.

3. Two towels and a safety pin.

4. A receptable to receive the expressed material,

[1] A common form of stomach pump is similar to a long lavage tube, but is supplied with a bulb that, when squeezed, acts as a suction pump.

either a suction bottle or a conical specimen glass is generally used.

5. A gauze compress or handkerchief.
6. A kidney basin.

General instruction regarding test meals.—Give meal on an empty stomach.

See that the patient does not take anything else by mouth until meal is expressed, unless otherwise prescribed.

Give exactly the amount of food ordered.

Càution patient to masticate meal thoroughly.

Procedure for Expression.—The expression is generally performed by the doctor, but nurses must understand the technic.

Have the patient lying or sitting comfortable, as for lavage.

Pin a towel around her neck and if she has on a tight collar loosen it. Place the kidney basin and compress where the patient can reach them if an excessive flow of saliva and mucus is incited by the passage of the tube.

Place the receptable to receive the stomach's contents in position. If a stomach pump is used it should be placed where the open end of the tube will extend into it and somewhat lower than the patient's stomach. If a syringe or Politzer bag is used, the receptable is placed on a table convenient to the operator's reach.

Lubricate the tube if necessary and introduce it in the same manner as for lavage. If a stomach pump is used merely squeeze the bulb to remove the air from the tube and the stomach's contents will then flow into the receptacle. If a syringe is used press in the piston, insert the point in the free end of the stomach tube and pull out the piston, the material from the stomach is then drawn into the syringe, if it should not be, pinch the tube to prevent

the entrance of air, remove the syringe, push in the piston and then, still holding the tube, reinsert the syringe point, release the pressure on the tube and once more draw out the piston. Empty the contents of the syringe into the receptacle and, if all the stomach's contents have not been withdrawn, repeat the procedure. The bag is used in the same manner as the syringe except that the air is expelled by squeezing the bulb.

Withdraw the tube in the same manner as after lavage. Remove and put away the equipment. Label the specimen in the required manner and take it to the laboratory.

On the chart record (1) the hour at which the test meal was given and its nature; (2) The hour at which the expression was performed and the amount, odor, and general character of the expressed material.

Fractional Gastric Expression

Purpose.—To determine the curve of hydrochloric acid secretion.

Requisites.—Tray containing:

1. Duodenal tube with portion to be inserted coiled around ice in a dressing basin. (A duodenal tube differs from a stomach tube in being somewhat stiffer and having a metal capsule on the tip, see Fig. 45.)

2. Six large sized test tubes in a container that will keep them standing upright. There should be a plug of sterile absorbent cotton in each tube.

3. Litmus paper, red and blue.

4. Luer or triumph syringe.

5. Kidney basin.

6. Rubber band or small forceps.

7. The articles required for the preparation of the patient as in gastric lavage

Procedure.—The nurse prepares the tray and patient and assists the doctor as required.

The patient is given no food before the first expression.

The duodenal tube is introduced in the same manner as the tube in gastric expression.

The specimen is obtained by aspirating with the syringe, *i. e.*, the point of the syringe is inserted in the free opening of the tube and the piston is then drawn out.

The expressed material is emptied into a test tube.

The patient is then given an Ewald or other test meal as prescribed by the doctor.

At the time specified by the physician the remaining specimens (usually 5) are expressed at intervals of 15 minutes. The tube remains in place in the intervals between these later expressions and, after each specimen is taken, is clamped with the rubber band or forceps.

Each specimen is emptied into a test tube as soon as obtained and the tubes are to be labelled in the regulation manner and taken to the laboratory.

Chart the hours of expression, the nature of the test meal, the number of specimens sent to laboratory, the length of intervals between expressions.

Demonstration 73

Duodenal Expression and Duodenal Lavage

Purpose of duodenal expression.—To determine whether or no there is a free flow of bile and whether or no the bile contains abnormal constituents, it is likely to do so when there are abnormal conditions of the duodenum, bile ducts, gall-bladder, or liver.

Requisites.—The same as for fractional gastric expression except that a suction bottle is sometimes substituted for the syringe and test tubes.

If the intestine is to be lavaged there will also be needed after the expression is completed, an irrigator with about two feet of tubing attached that is supplied with a stop-cock and has a glass connecting tube in its free end, and, in the irrigator, the prescribed solution. A sodium sulphate solution is very commonly used for the purpose. The strength ordered varies between 9 and 15 grains of the salt to 1 quart of water. About 1½ quarts are generally used. The temperature is usually between 105° and 108° F.

If the irrigation is given without expression the same equipment is required as for the latter treatment minus the syringe or suction bottle and plus the irrigator and solution.

Procedure.—The treatment is carried out by the physician, the nurse's duties being to prepare the tray and pa-

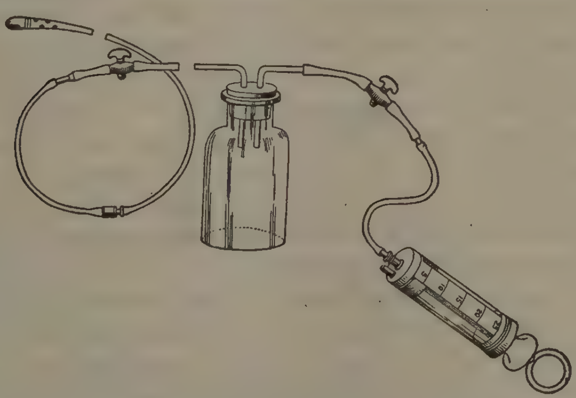

Fig. 45. Duodenal tube with suction bottle and pump.

tient and assist the physician as required. She should tell the patient beforehand just what she will be required to do.

As a rule, the patient is not given food for 12 hours preceding the treatment so that the stomach will be empty, but she is encouraged to drink warm water in small amounts at frequent intervals.

For the operation the patient sits up at first as when the lavage tube is passed, but after the tube reaches the stomach, she is made to lie down on her right side and pillows enough (usually two are required) are put under her hips to raise them eight or ten inches. This is to make the pyloric end of the stomach dependent, which, aided by gastric peristalsis, causes the capsule to pass slowly into the duodenum. No pillow is allowed under the head. The patient can drink a little water from time to time if she wishes to.

When the tube is in the duodenum (this is usually when the second mark on the tube is reached, which is 70 cm.—28 inches—from the point, or when, if the tube is given a slight pull, resistance is felt) either the tip of a syringe or the connection of the suction bottle (from which all air must previously be expelled) is inserted in the free end of the duodenal tube. Expression with the syringe is performed by drawing out the piston of the syringe and the material obtained is at once emptied into a test tube. If the suction bottle is used it is placed somewhat lower than the patient, and the valve on that side opened, whereupon the duodenal contents will be forced into the bottle. In order to ascertain if it is intestinal, and not gastric, matter the reaction is tested with litmus or other indicator. Once the flow is well started, it need not be interfered with if the cork in the suction bottle is loosened slightly to allow of using the indicator. Duodenal material will be of alkaline reaction, viscid, and of uniform color. Gastric material is acid or, if there is no food present, it should be neutral.

If the intestine is to be lavaged, the irrigator containing the solution is suspended about 6 inches above the patient, the air is expelled from the tubing by letting solution run through it, and as soon as the expression is completed, the syringe or suction bottle, as the case may be, is withdrawn. The end of the tube is clamped. The patient propped into a sitting position with pillows and the connecting tube on the irrigator tubing is then inserted in the free end of the duodenal tube, the clamp removed and the solution allowed to flow. The solution is not siphoned back, as in gastric lavage, the object being to let it pass through the entire intestinal tract, from which it will be ejected, via the rectum, usually in an hour or two. That it may do this and not be absorbed a solution of a salt such as sodium sulphate, that inhibits the absorption of water is used.

After all the solution has been given the duodenal tube is withdrawn rather slowly.

Demonstration 74

Gavage

By gavage is meant the introduction of food into the stomach through a tube. Unless otherwise specified, it is the stomach tube that is used. Food and medicine may be given in this way when the patient either cannot or will not take them in the usual manner. Any form of liquid food can be given by gavage.

Requisites.—1. The food.

2. The stomach tube, lengthened, if necessary, with tubing.

3. A funnel which is inserted in the open end of the tube.

4. Glycerin to lubricate the tube and a gauze sponge to apply the lubricant.

5. A towel.

If the patient is delirious or insane, some restraining appliance may be necessary and a mouth gag or substitute.

Procedure.—Wash your hands.

Restrain the patient, if absolutely necessary, and, in such case, put the mouth gag between her teeth.

Place the patient in the same position as for lavage.

Put the towel around her neck.

Lubricate a few inches of the tube if necessary.

Expel the air from it and introduce it in the same manner as for lavage.

Fill the funnel, but allow a few seconds to elapse before letting the liquid run so that the muscular contraction induced by the insertion of the tube may subside, otherwise, particularly if the patient is nervous or struggling, the food may be vomited. Do not hold the lower part of the funnel more than three or four inches above the patient for the liquid should enter the stomach slowly.

As soon as the last of the food has left the funnel, compress the tube at the stem of the funnel and, with the other hand, grasp the tube near the patient's mouth and whip it out quickly.

Demonstration 75

Nasal Gavage

By nasal gavage is meant the introduction of food into the esophagus through the nose.

Purposes.—It is used chiefly following operations on the mouth and when a patient is so obstreperous that it is difficult to insert a tube through the mouth.

Requisites.—The same as when the stomach tube is used except for the substitution of a catheter for the tube and, even if the patient is obstreperous, a mouth gag will not be necessary.

Precautions.—1. Use no force when inserting the catheter, if there is any obstruction in the nostril, remove the tube and insert it in the other side, for the septum of the nose is rarely straight and, consequently, if one of the cavities is smaller than normal, the other will be just so much the larger.

2. Especially when giving the gavage following an operation on the mouth, look into the latter before letting the liquid enter the tube, because the catheter occasionally enters the mouth, instead of the esophagus.

3. Wait a few seconds after introducing the catheter before pouring in the liquid, for retching may be induced by the irritation of the tube, and if the food is given before this subsides it may be vomited. Formerly it was taught that it was necessary to do this because there was danger of getting the catheter into the larynx and, if food were then poured in, the patient would be practically drowned, but experience has shown that it is almost impossible to do this unless the patient is in such a state of shock that the throat muscles are almost completely relaxed and, if the catheter did enter the larynx, such a spasm of coughing would be induced that it would be clear that something was wrong. Of course if the patient were in collapse or under the influence of an anesthetic the cough reflexes might not be stimulated, but the patient would become cyanosed and if the funnel were held to the ear a whistling sound would be heard.

Procedure.—Wash your hands. Put the towel around the patient's neck.

The patient can be either lying down or sitting, but her

head is to be either straight or bent slightly forward for, if it is bent backward, the catheter is likely to enter the mouth.

Lubricate three or four inches of the catheter and insert it, keeping it slightly curved and pointing toward the septum. It is to be passed into the esophagus for about four inches, but it is not necessary for it to reach the stomach.

The fluid is to be given slowly, therefore, hold the funnel with its lower opening not more than three inches above the patient. As soon as the last of the liquid has left the funnel compress the catheter and remove it quickly.

Gastrostogavage

By gastrostogavage is meant feeding through a gastric fistula. A gastric fistula or opening into the stomach is made for this purpose when an obstruction in the esophagus or cardiac end of the stomach prevents the person taking food in the usual manner. Common causes for such obstructions are: Carcinoma and contractions resulting from erosion by corrosive poisons.

When the fistula is made a catheter is inserted and the free end of the latter is brought above the surgical dressing, and the binder covering the wound and it is clamped near the opening.

Requisites.—1. The food.[1]

2. A funnel with about three inches of tubing attached and a glass connecting tube in the free end of the latter.

Carry these to the bedside in a basin or on a tray covered with a towel.

[1] Any kind of liquid food can be given in this way. Milk, plus dextrose and finely divided protein material, as prepared caseinogen, is commonly used.

Procedure.—Put the towel around the free end of the catheter. Fill the funnel. Expel the air from the tubing by letting some of the liquid flow through and back into the pitcher.

Insert the connecting tube in the catheter and open the clamp.

Let the fluid flow slowly into the stomach. Do not allow the funnel to become empty during the process, and as the last of the food flows from it clamp the catheter. Compress the tube and remove it.

Precaution.—Care must be taken when handling the catheter for, otherwise, it may slip either into or out of the stomach.

CHAPTER XIV

Catheterization and Bladder Irrigation

Reasons for catheterization. Precautions necessary when passing the catheter. Technique of passing the catheter on (1) a woman, (2) a man. Expedients that can be tried to cause voluntary micturition. Purposes and technique of bladder irrigation. Catheterization of the ureters.

By catheterization is meant the removal of fluid from a body cavity. The term is used more especially in connection with the withdrawal of urine from the bladder or ureters.

Demonstration 76

Catheterization of the Bladder

Catheterization of the bladder is resorted to (1) when for any reason there is undue retention of urine in the bladder. **How long it will be safe to allow a patient to go without voiding urine** will depend upon several factors, *e. g.*, following parturition or an operation on the uterus, a bladder that is much distended might cause trouble and therefore, for the first day or two the catheter is generally passed about every eight or ten hours, if urine is not voided normally, otherwise, unless the bladder becomes distended, it is usually only done about every twelve hours, but this is for the doctor to decide; (2) women are catheterized when a sterile specimen of urine is wanted; (3) preceding operations on the pelvic organs and, (4) sometimes, following perineorrhaphy, in the first case

because the urine becomes contaminated in its passage through the vagina, in the second, because if the bladder is at all distended it might be punctured, and in the third to avoid irritation or infection of the stitches.

Conditions particularly likely to cause retention[1] of urine are: (1) Depression of the nervous system (as when a patient is suffering from shock or is in collapse and following anesthesia), (2) nervousness, (3) abnormal conditions of the bladder and urethra. The ingestion of a small amount of water and profuse perspiration or loss of fluid from the body from other cause are conducive to retention because the secretion of urine is then lessened and, naturally, if there is little urine in the bladder the stimulus which promotes micturition will not be excited.

Except when it is essential for a patient not to void urine, catheterization is to be avoided if possible because (1) a break in aseptic technic is likely to be followed by cystitis, (2) after catheterization a patient's power to void urine voluntarily is frequently reduced for a time, this is especially likely to be the case when the retention is due to abnormal nervous conditions. Therefore, except when there is a special reason for catheterization, means to induce voluntary micturition should always be tried before passing the catheter.

Means commonly used to induce voluntary micturition are.—Placing the patient on a bedpan and pouring hot water over the vulva, applying hot compresses or a hot-water bag over the pubes and, if the patient is near a bathroom letting the water run from the faucet (the last mentioned procedure is generally only of use if the retention is due to nervousness), having the patient drink as

[1] When anuria (*no urine*) is due to failure of the kidneys to secrete the urine the condition is known as *suppression*, when the bladder fails to discharge the urine secreted the condition is termed retention.

much water as possible; also a warm enema and, when the patient is not confined to bed, a sitz bath are often successful, but these expedients can be used only when prescribed by the physician.

Precautions necessary when passing the catheter are: Maintain the strictest asepsis.

Do not touch the catheter near the end that is to be inserted nor let it come in contact with anything unsterile, *e. g.*, the labia.

Examine a glass catheter before inserting it to see that it is intact, for glass is often cracked during sterilization.

Do not use a glass catheter for a pregnant, delirious, or unconscious patient, nor a child.

Never use force when inserting the catheter.

Instruct the patient to avoid straining during catheterization if, as is frequently the case, she attempts to do so.

If the bladder is much distended do not remove more than 540 to 600 c.c. at one time, since a sudden extreme release of tension on the wall of the bladder, when it has been unduly stretched for some time, temporarily tends to lessen the contractile power of its muscle tissue and thus to interfere with free voluntary micturition; also the rapid emptying of almost any over-distended cavity is to be avoided because of the changes likely to arise in the circulation when the pressure made on the local blood-vessels by the extension of the walls of the cavity is released suddenly since, if many blood-vessels are involved, a very considerable amount of blood may at once flow into these vessels.

Equipment.[1]—1. A sheet and, if the ward is cold, a shoulder blanket.

[1] In addition to the catheters needed to demonstrate the process of catheterizing, different kinds should be on hand—*e. g.*, glass, rubber silk, self-retaining and a Y or return-flow catheter.

2. A small rubber.
3. A dressing towel.
4. A receptacle for the used sponges.
5. A light, if necessary.

On a scrubbed tray that is covered with a sterile towel:

1. Two or three catheters[1] sterilized as described, page 47. In some hospitals the catheters are brought to the bedside in the utensil and water in which they are sterilized; in others, they are transferred from the sterilizer, *with sterile forceps*, to a basin containing boric acid, or they are put between the folds of a sterile towel.
2. A sterile basin containing the solution[2] for cleansing the vulva, and six sterile pledgets.
3. Sterile forceps.
4. Two sterile towels in addition to those used to cover the tray and the sterile utensils.
5. A sterile basin[3] for the reception of the urine, and, a sterile specimen bottle stoppered with sterile absorbent cotton.
6. Sterile gloves.[4]
7. If a rubber catheter is used, sterile glycerine or oil.

Cover these with a sterile towel.

[1] Two, and if there is likely to be trouble in finding the meatus as following parturition, three catheters are prepared in case one should be rendered unsterile before it is inserted.

[2] Either boric acid 2% or biniodid of mercury 1:5000 is very commonly used. The solution should be warm.

[3] The basin for the urine has to be sterile because it is necessary to touch it after the hands have been disinfected.

[4] In some hospitals the nurses are always required to wear gloves when catheterizing. In others, this is only considered necessary if a rubber catheter is used, because, with the glass catheter it is not necessary to touch it higher than the bend and this does not enter the vulva.

Procedure.[1]—Replace the bed covers with the sheet, placing the latter lengthwise across the bed, put the blanket over the patient's chest.

Have the patient, if possible on her back though the treatment can be given, if absolutely necessary with her on her side.

Flex the patient's knees, raise her slightly and put the rubber covered with a dressing towel, under her for about two inches.

Draw the sheet up in the center to the pubes and drape the end around the legs.

Place the table holding the sterile utensils where you will be able to reach everything easily with your right hand.

Scrub and disinfect your hands as carefully as though preparing for a surgical dressing and, if the rules require it, put on the gloves.

Place the sterile towels over the sheet, one on each side around the vulva and with them, using your left hand, draw back the sheet so as to adequately expose the vulva.

Take the stopper from the specimen bottle if one is to be used and place the latter where you will be able to reach it easily when wanted.

Place a basin on the bed against the vulva, with your left hand.

Take a sponge with the forceps, squeeze excess solution from it by pressing it against the inside of the basin. Separate the labia with the thumb and first finger of the left hand; wash down over the meatus toward the anus,

[1] Whenever it is possible there should be two nurses for this treatment and one should prepare the patient while the other is scrubbing her hands, for it is very annoying for the patient to wait after she has been prepared.

making as much pressure as possible without causing discomfort. Do this four times, using a clean sponge each time. Take a fifth sponge and place it between the labia just below the meatus.

Take the catheter in your right hand. If it is of glass hold it at the bend and examine it carefully to see that it is intact. With the open end pointing upward, insert it, gently in a slightly backward direction holding it loosely so that it will turn in accordance with the shape of the urethra until the open end points downward (it will do this with very little guiding). Cease moving the catheter as soon as the urine begins to flow, but if the current ceases before as much is passed as you expect, introduce the catheter, very gently, a little further.

If a specimen is required hold the specimen bottle in place to receive it as soon as the flow starts. The stopper is to be replaced in the bottle as soon as the catheterization is completed.

When no more urine passes, put your finger over the open end of the catheter—to prevent that remaining in the latter dripping in the bed—and remove it.

Remove the basin containing the urine.

Remove the sponge that you placed between the labia. Wash the vulva with a moist pledget and dry the parts with a sterile towel.

Make the patient comfortable and remove the apparatus.

Measure the urine and record the amount obtained.

Difference in procedure when a rubber catheter is used.—Wear a sterile glove and hold the catheter about 2 inches from the point, between your thumb and first finger, with the remainder, except the open end, loosely coiled in your hand. Lubricate the end to be inserted by dipping it into sterile oil or glycerine.

Insertion of a Self-Retaining Catheter

Sometimes it is necessary to leave a catheter in the bladder in order to keep the latter empty and, as a rule what is known as a *self-retaining catheter* is then used. This type of catheter is of rubber and has a round or oval hollow projection about half an inch below the point of the end that is introduced into the bladder. When inserting such a catheter the projection must be obliterated; this, if the patient is a woman, is most easily done by stretching the self-retaining catheter over a small glass one and, for a male patient over a large blunt-end probe or applicator.

Catheterization of a Male Patient

Equipment.—1. Two catheters, usually soft rubber ones, unless otherwise specified other kinds used for male patients are hard rubber, waxed, and silk. The method of preparing these for use was described in Chapter III.

2. A sterile basin to hold the catheters.

3. A sterile basin containing boric acid.

4. Four sterile sponges of gauze or cotton, 2 dry and 2 in the solution.

5. A sterile lubricant, usually either oil or vaseline.

6. A sterile urinal or basin to receive the urine.

7. Two sterile towels.

These articles are all placed on a sterile tray and covered with a sterile towel.

Procedure.—As a rule the nurse's duties are merely to prepare the tray, for a nurse is very rarely called upon to catheterize a man; however, nurses should have some idea of the method in case of emergency. The technique is as follows: Raise the penis to an angle of about 60°

from the body. Draw back the prepuce. Cleanse the glans with boric acid solution, then wrap a small piece of gauze around the corona. The gauze covers any secretions which may remain and prevents the prepuce from slipping back over the glans. Hold the penis with the second and third finger of the left hand; separate the lips of the meatus with thumb and forefinger and cleanse them. Oil the catheter, and introduce it slowly until an obstruction is met, which will generally occur even in the normal urethra when the catheter has passed in about six inches. Wait fully a minute, then make gentle pressure, and the catheter will readily enter the bladder. A medium size or large catheter is passed more readily than a small catheter in normal urethras.

Demonstration 77

Irrigation of the Bladder

This treatment is used for the same purposes as the douching of other mucous-lined cavities. See Chapter XII.

Solutions commonly used for cleansing purposes are sterile normal saline and sterile boric acid 2%; and, for disinfection, potassium permanganate 1:1000, silver nitrate 1:1000—1:2000 and protargol 1:1000.

The temperature usually prescribed is between 100° and 106° F.

Method 1. Equipment.—The articles required for catheterization, but return-flow or Y catheters are used and in addition, there will be needed: 1. A sterile basin with a capacity of at least 1 quart.

2. The solution (about one quart is generally prescribed) in a sterile graduated glass irrigator. to which is

attached sterile rubber tubing, of one-fourth inch bore, provided with a clamp. The irrigator is to be covered with a sterile towel.

3. A sterile thermometer.

4. A piece of sterile rubber tubing, one-fourth of an inch bore, eighteen inches long, provided with a clamp.

5. An irrigator stand.

Procedure.—Hang up the irrigator about twelve inches above the patient.

Catheterize the patient as already described. Leave the catheter in place. Remove the basin containing the urine and replace it with the empty one.

Let solution run through the tubing connected with the irrigator until all air is expelled from it.

Attach the irrigator tubing to the upper projection of the catheter and the other piece of tubing to the lower projection, see that the clamp on the latter is closed, put the free end in the basin.

Open the clamp of the irrigator tubing and let one half pint or more (up to three fourths of a pint if distress is not caused) run slowly into the bladder, then open the clamp of the tubing for the return flow; the solution should now flow in a continuous stream into and out of the bladder, but, there will be about half a pint of solution remaining in the bladder because of the restriction of the return flow at the beginning. The need for this is twofold: (1) That the walls may be bathed with solution, as they will not be unless the bladder is somewhat distended with solution; (2) to prevent the inflamed bladder walls coming in contact with the catheter which might still further irritate them.

Shut the stop-cock on the irrigator tubing before the solution reaches the exit of the reservoir. Let all the solution flow from the bladder. Remove the catheter

and finish the treatment as when catheterizing the patient.

Method 2. Equipment.—The same as for Method 1 with the following exceptions: Have rubber[1] catheters, instead of the Y; insert a sterile glass connecting tube in the free end of the irrigator tubing; no extra piece of tubing for the return flow will be needed; the dish to receive the return must be graduated[2] or a sterile glass measure that will hold about half a pint can be put in the basin and emptied as required (a large measure would be too tall for the purpose).

Procedure.—This will be the same as for Method 1 with the following exceptions: After between half and three-fourths of a pint of solution has entered the bladder, check the flow[3] and disconnect the catheter from the connecting tube—being very careful while doing so not to allow the catheter to move in the bladder and allow about half of the solution injected to return; then check the flow[4] and reconnect the tubing; allow as much solution to enter as was returned and then disconnect the catheter as before. Repeat the process until the solution returns clear or the desired amount has been given.

[1] Rubber catheters are to be preferred to glass for this purpose because the latter move too easily in the bladder when connected and disconnected.

[2] A glass dish can be easily marked for purposes of this kind by pouring in for example, half a pint of water and marking the level with a file or oil paint, adding another half a pint of water and marking this level and so on.

[3] Do this by making pressure with the fingers.

[4] Some physicians prefer to have the bladder completely emptied after each injection but others, for the reasons given under Method 1, do not wish this done, at any rate more than once during the treatment. It can be easily appreciated that the same solution does not stay in the bladder all the time.

Method 3. Equipment.—The same as for Method 1 with the following exceptions: Have rubber catheters; have the solution in a sterile graduated measure; instead of the irrigator and stand, have a half pint funnel to which attach the eighteen inches of sterile rubber tubing, insert a glass connecting tube in the free end of the tubing; the basin for the return solution must be graduated as for Method 2.

Procedure.—After catheterizing the patient and changing the basins, fill the funnel with solution and, holding it as described, page 387, let about half of its contents flow through the tubing. Check the flow and insert the free end of the connecting tube in the catheter. Fill the funnel, raise it about ten or twelve inches and, as necessary, pour in more solution so that a slow steady stream will enter the bladder (*never allow the funnel to become empty*)[1] until between 180 and 300 c.c. (6 to 10 ounces) have been given; then lower and invert the funnel over the basin and allow about one half the amount given to return, then quickly fill the funnel, raise it slowly and allow as much fluid as came out to flow in; then lower the funnel and allow this much to return. Repeat the process until the solution returns clear or the required amount has been given.

Catheterizing the Ureters

Purpose.—The ureters are catheterized for diagnostic purposes in order to determine whether or no both kidneys are diseased or not functioning properly or, if only one is affected, which one is at fault.

The operation is always performed by the doctor and the proceedings cannot be taught by demonstration nor very definitely described, therefore the following descrip-

[1] If air gets into the catheter it will interfere with siphonage.

tion is meant merely to give some idea of the nature of the operation and the nurses' responsibilities.

The nurses' duties consist in preparing the patient and the required utensils, keeping things sterile and making sure that the urine from the two ureters is kept separate and not mistaken one for the other. In order to prevent a mistake of this kind, the catheter used for each ureter and the glass intended to receive the urine from each one are marked right and left respectively and are kept separate and a nurse must read the marking as she passes the utensils to the doctor or as he takes them from the tray.

The preliminary preparation of the patient generally consists in, for a woman, cutting or shaving the hair around the parts. A nightgown, wrapper, and laparotomy stockings are usually worn, and, unless the patient is taken to the treatment room on a stretcher, slippers. The patient is placed on the table in the lithotomy position, the wrapper folded above the pubes so that it will be out of the way, and a sterile sheet is draped about the lower part of the body as described in Chapter X. The local preparation consists in washing the vulva and its surroundings with (1) soap solution and hot water and (2) a disinfectant. Everything used for the purpose must be absolutely sterile. Following this, the bladder is catheterized and irrigated. This is usually done by the doctor just previous to passing the catheter into a ureter.

The articles needed in addition to those for catheterizing and irrigating the bladder will be: a cystoscope, two silk elastic catheters and two large test tubes to receive the urine, marked as previously mentioned, a sterile lubricant for the catheter, whatever anesthetic the doctor requires and the means for giving it, sterile gown and gloves for the doctor and assistant.

Needless to say, everything used for the purpose must be absolutely sterile. The cystoscope can be prepared by washing it with green soap and water and letting it stand in a disinfectant such as formalin 4%, or carbolic 20%, or alcohol 75% for at least half an hour and, just before it is needed, put it into boric acid 2% or sterile water; the methods of sterilizing the other articles have been already described.

CHAPTER XV

Medication

Different ways of giving medicine. Prescription book. Abbreviations and symbols used in writing prescriptions. Special points to remember regarding the care necessary in the administration of medicines. Two common systems of regulating the administration of medicines. Methods of giving medicine by: mouth, subcutaneous and intramuscular injections, scarification, and inhalation. Nature of antitoxins and vaccines and methods of administering them. Application of medicine to the throat and eye.

Medicinal substances are used to cause both local and general or systemic effects. For local effects they must be so applied that they will come in contact with the part that they are to act upon; for systemic effects they must be either absorbed by the blood or act upon nerve-endings and thus obtain results through the nervous system as described under counterirritation Chapter XVI.

Drugs may be given.—By mouth; through the lungs (by inhalation); by rectum; as subcutaneous, intramuscular and intravenous injections; and they may be applied externally.

The Prescription Book

In order to prevent mistakes in receiving and carrying out physician's orders and to protect nurses from

unjust accusations, it is a common custom in hospitals for each ward or floor to be provided with a *prescription* or *order book* and the nurses, except in emergency, are not allowed to give medicines or treatments until the order is written in the book by the physician or, if he authorizes a nurse to write it, signed by him. If the order is necessarily given by telephone or, for any other reason, it is impossible for the doctor to write or sign it, the nurse receiving the order is required to write it in the book and sign her name.

Abbreviations and chemical symbols very commonly used in writing prescriptions are as follows:

Abbreviation	*Derivation*	*Meaning*
aa	ana	of each
A. c.	ante cibum	before meals
Ad lib.	ad libitum	as much as desired
Alt. dieb	alterius diebus	every other day
Alt. hor.	alterius horis	every other hour
Alt. noc.	alterius nocta	every other night
Aq. dest.	aqua destillata	distilled water
Aq. pur.	aqua pura	pure water
B. i. d.	bis in die	twice a day
C.	congius	a gallon
C.	.. .. ..	centigrade
Cum.	cum	with
Cc. or c.c.	.. .. ..	cubic centimeter
Cap.	capiat	let him take
Dil.	dilutus	dilute
F.	.. .. ..	Fahrenheit
F.	fac	make
Fld.	fluidus	fluid
Ft.	fiat	let it be made
Gm.	.. .. ..	gram, grams
Gr.	granum, grana	grain, grains
HCl	chemical symbol	hydrochloric acid
KI	chemical symbol	potassium iodid
Lb.	libra	pound

Liq.	liquor	liquid
M.	misce, mistura	mix, mixture
M.	minimum	a minim
Mil.	.. .. ..	milliliter
NaCl	chemical symbol for sodium chlorid	salt
O.	octarius	a pint
P. c.	post cibum	after meals
P. r. n.	pro re nata	as occasion arises
Pulv.	pulvis	powder
Q. h.	quaque hora	every hour
Q. s.	quantum sufficit.	as much as is sufficient
℞	recipe	take
S. or sig.	signa	give the following directions
S. o. s.	si optus sit	if necessary
Ss.	semi, semissis	one half
T. i. d.,	ter in die	three times a day
Tinct, or tr.	tinctura	tincture
Ung.	unguentum	ointment
μ	micron	the millionth part of a meter
ʒ	drachma	dram
℥	uncia	ounce

Points of special importance to remember regarding the care, measuring, and administration of medicines are:

1. Keep medicine cupboards locked and do not leave the key where patients can get it.

2. To expediate giving medicines it is well to keep them, as far as possible, in alphabetical order, but with those intended for external use and the stronger poisons separate from others and, especially the latter, in bottles with a rough exterior, or other easily discernible characteristic, and marked "For External Use" or "Poison."

3. Never have medicines in unmarked bottles and do

not use a dose of medicine that has been left in an unmarked glass.

4. The nurse in charge of the medicine cabinet should examine its supply daily and make sure that there is an adequate amount of all necessary drugs on hand, but medicines should not be ordered in large quantities for many kinds deteriorate with age; for this reason a drug that has undergone any change in color, odor, or consistency should not be used without first consulting the head nurse.

5. Keep oils in a cool place. Also many of the antitoxins, vaccines, and drugs derived from animal glands need to be kept cold.

6. Give médicines on time.

7. While measuring medicines, never think of anything but the work on hand and never speak to anyone nor allow anyone to speak to you.

8. Use graduated glasses and pipettes, not spoons, for measuring.

9. Measure minims, when minims are ordered, and drops when drops are ordered, fcr, in some drugs, there is a marked difference between the amount in minims and drops.

10. Measure exactly; never give a patient a drop more or less than the amount ordered.

11. While pouring a medicine, hold the glass with the mark of the quantity you require on a level with your eye; if the mark is above your eye, you will give too little, if below, too much.

12. Read the label on the bottle thrice, before taking it from the shelf, and before and after pouring out the drug.

13. Shake the bottle before pouring out medicines that are not perfectly clear or that have a sediment.

14. To avoid defacing the label while pouring a medicine, hold the bottle so that the label will be on the upper side, but do not let your hand come in contact with it, and before replacing the bottle on the shelf, wipe the rim of the bottle with a piece of gauze kept for that purpose.

15. Always recork a bottle immediately after pouring out the drug, for many medicines contain volatile substances and will thus become either stronger or weaker if left uncorked.

16. Never mix nor give at the same time, without consulting the head nurse, medicines which change color or form a precipitate when combined, for, when they do, a chemical change has probably taken place.

17. Some foods must not be given near the time for doses of certain drugs, *e. g.*, milk and eggs near a dose of calomel, the protein of which would combine with the mercury to form an albuminate of mercury. Drugs and foods which should not be given at the same time are mentioned in textbooks of Materia Medica and this is one of the important items for nurses to remember in this study.

18. Remember, and put into effect, all information given in Materia Medica regarding the dilution of drugs; three points of special importance are, (1) do not dilute syrup cough medicines, because dilution will minimize the soothing effect of the syrup on the mucous membrane; (2) drugs that will irritate the mucous membrane of the alimentary tract to an injurious degree are to be given well diluted; (3) saline cathartics that are given to lessen edema are to be given in a concentrated solution, for this favors the removal of fluid from the tissues, but when given for cathartic purposes only they are usually given

more dilute as they then act more quickly; for reasons and degree of dilution see Materia Medica.

19. Make doses of medicine as palatable as possible. Therefore, have the water used for dilution either very cold or very hot. When possible, give unpleasant tasting drugs, especially powders, in capsules or konseals, and have ice water or other drink at hand in a *clean glass* to give as soon as the medicine is taken. A good method of giving castor oil is to rinse the entire inside of the glass with lemon juice, and leave about one or two drams in it, put in a small piece of ice (about the size of a pea), pour in the oil and on top of this some more lemon juice or a dram of whiskey, or peppermint water and just before giving the patient the dose, add a little vichy water to it. Have a clean glass with vichy to give the patient afterward. *Oleum tiglii* (croton oil) can be given in a capsule if the patient is conscious, otherwise it is usually best given on sugar or in melted butter, and dropped on the back of the tongue.

20. Give acids and medicines containing iron through a tube, because acids may corrode the teeth and iron discolors them.

21. When giving medicine by mouth to an unconscious patient drop it far back on the tongue using a spoon, not a glass, and give it slowly.

22. Never give a delirious or unconscious patient a drug in pill or powder form, dissolve the drug before administration.

23. Never allow one patient to carry medicine to another; innumerable mistakes have been thus made.

24. Do not leave a patient until the medicine is swallowed.

25. Never record a medicine as given until the patient has taken it.

Demonstration 78

Measuring Medicines for Administration by Mouth

Requisites.—1. A tray holding medicine glasses.

2. A pitcher of ice water.

3. A gauze compress.

4. Bottles similar to those used for poisonous and non-poisonous drugs.

5. Cards or medicine list as required by the system in use in the hospitals in which the pupils are studying. The requirements for two systems that are in very common use are as follows:

System 1.—Pieces of thin colored cardboard, about two inches square, a different color for each period of administration; *e. g.*, red may be used to signify every four hours; pink, every three hours; blue, before meals; yellow, after meals; white, at night; gray, in the morning. The tickets are inscribed with the patient's name, the name and dose of the medicine, and the hour at which it is to be given. Also, if the medicine is to be given in some special way—*e. g.*, by hypodermic or inhalation, the fact is stated on the card. Tickets of each color are kept in a separate bundle.

(*The cards are made out by the "medicine nurse" from the prescription book immediately after the orders are given, then a check is made in the prescription book after each order to indicate that it has been copied, and the book and cards are left on the head nurse's desk that she may compare them; after doing so she places the cards in the card-container in the medicine closet. As soon as a medicine is discontinued the "medicine nurse" bends the card and leaves it with the prescription book on the head nurse's desk, the head nurse destroys the card.*)

MEDICINE LIST

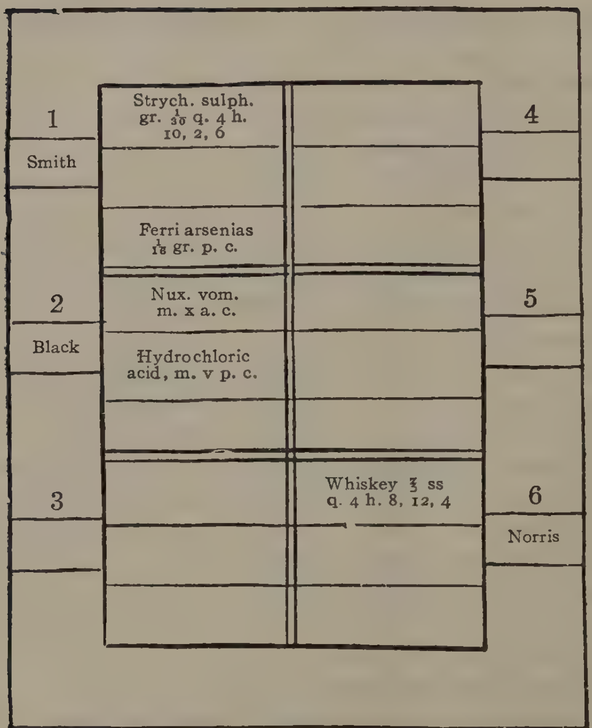

Fig. 46.

The holder for the medicine list consists of a flat piece of metal painted with white enamel, of sufficient size to be divided into as many spaces about 2 in. sq. as there are beds in the ward. The holder is surrounded with a frame. This frame is only attached to the foundation at the points of the metal strips which divide the squares, in order to leave a space between the two to allow of the insertion of the cards bearing the name of the medicine, etc. The squares are subdivided by narrow strips of grooved metal so that a separate space can be alloted to the several times when the medicines are to be given and differently colored cards should be used for the various times of administration. The frame is provided with grooved strips to hold the patients' names and the numbers are painted on it in black or other dark color paint,

System 2.—This requires a medicine tray marked in numbered squares, the numbers corresponding to those of the room or, in a ward, the beds, and a medicine list. A convenient form of list is shown in Fig. 46. The same precautions to avoid errors are taken with the cards used for such lists as with those used for System 1.

Procedure for System 1.—Spread out the tickets of the color for the hour of administration in a row or rows, putting all those calling for the same drug together.

Take a medicine glass in the left hand and, after reading the label, the bottle of medicine in the right. Hold these as directed in sections 11 and 14.

Shake the bottle if necessary.

Read the label.

Take the cork between the third and fourth fingers of the left hand and extract it. Hold it thus while you are pouring out the drug.

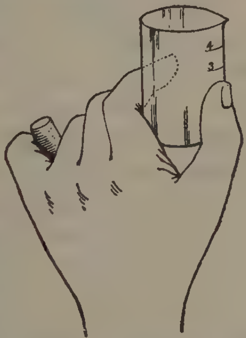

Fig. 47. Method of holding cork and glass while pouring medicine.

Raise the glass until the mark representing the amount of drug that is to be given is on a level with your eyes.

Pour in the drug until it is on a line with this mark.

If more than one patient is getting the same medicine, pour out the number of doses required; if not, put the cork in the bottle, wipe the rim of the latter with the gauze compress, read the label on the bottle and return it to the shelf.

Pour some ice water into the glass or glasses and cover the latter with the tickets. Note the directions on these and be sure that you have complied with them.

Proceed in the same manner until all the medicines needed have been measured.

Put some empty glasses on the tray. These may be wanted to give patients water.

Carry the tray and its contents and a pitcher of water to the patients.

Read the patient's name on each card before giving the medicine.

After all the medicines are given count the cards, to make sure that you have not lost any, and put them away.

Wash the medicine glasses.

Procedure for System 2.—Place the medicine list where it can be easily read.

Put a medicine glass in each of the squares with the numbers for the patients who are to have medicine.

Read the list and notice how many patients are to have the same medicine so that all doses of the same drug may be poured before putting away the bottle.

Pour the medicines in the same manner as for System 1 and, after pouring each drug, put the glass back in its right square. After all the medicines are poured, add water or other diluent as required.

Before giving a patient a drug note the number of the square from which you take the glass.

Demonstration 79

Subcutaneous and Intramuscular Injections

Requisites.—1. A hypodermic-tray. (The so-called *hypodermic-tray* usually consists of a glass or enamel tray holding (a) an alcohol lamp provided with an attachment[1] for sterilizing the needle and boiling the water;

[1] When there is no such attachment a silver tablespoon is used as a substitute.

(b) matches; (c) a small jar containing alcohol 70%, and (d) one containing alcohol 95%[1] and a small pair of forceps; (e) a small jar containing sterile sponges and swabs; (f) a bottle of sterile water; (g) a small oval tray

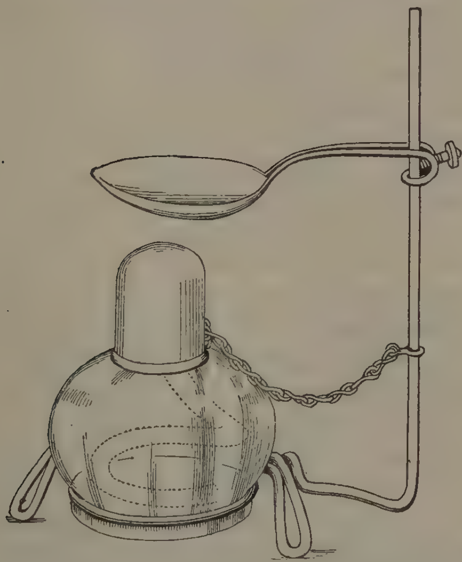

Fig. 48. Lamp and spoon-shaped pan for sterilizing hypodermic needles.

or dish; (h) a hypodermic syringe and needles.)[2] 2. Samples of drugs used for hypodermic injections, both liquids and tablets, antitoxins, and vaccines. 3. Col-

[1] When a metal instrument is kept in alcohol the latter must be at least 95%, for, if it is diluted, the water will cause the metal to rust. The forceps, the jar of sponges, and the bottle of water are sterilized daily and the jar and bottle refilled.

[2] Several sizes should be provided for class.

lodion, for use after intramuscular injections.[1] 4. A bottle of sterile salt solution; this is only required for class, it is to be used instead of a drug.

Nature of subcutaneous and intramuscular injections.—A subcutaneous[2] or hypodermic[3] injection consists, as the names imply, in the injection of a drug below the skin, while an intramuscular injection is one in which the drug is injected into the muscles.

Purposes.—Drugs are given in these ways when (1) quick results are necessary; (2) the drug is likely to be vomited, either because of the patient's condition or the nature of the drug; (3) the drug will be undesirably affected by the gastric or intestinal secretions; (4) the drug is not readily absorbed from the alimentary tract; (5) the effects of the drug are required at the area of its injection.

Depth of injections.—From what has been said regarding the nature of the injections it can be appreciated that **the difference between the two types** consists in the depth of their introduction into tissues, but even the subcutaneous ones are made at a depth of about three-quarters of an inch, except when the drug is used to promote local anesthesia. The reasons for this being that (1) if the drug is injected into, instead of under, the derma, it will not be readily absorbed; (2) just below the epidermis and the covering of the mucous membranes there are far more nerve endings that, if stimulated, will give rise to a sensation of pain than there are in the deeper tissues and they will be stimulated by a drug injected in

[1] As a rule subcutaneous injections are the only ones that can be demonstrated in class, but it is highly advisable that the pupils should give each other such injections, since it is well for them to know what they feel like.

[2] From the Latin *sub* = under and *cutis* = skin.

[3] From the Greek words signifying below the skin.

their midst, unless this, as the local anesthetics do, depresses them. On the contrary, to get the best results from the majority of drugs used as local anesthetics, it is necessary to inject them where they will come in contact with the nerve endings that they are to depress.

Intramuscular injections are used as a rule in preference to the more superficial ones when a large quantity of liquid is to be given, when the drug is particularly irritating and when it is not easily absorbed, for absorption takes place more readily from the deeper tissues.

Except for a few differences in procedure that will be mentioned in the text, the methods of giving both types of injections are the same as are also the precautions that must be taken.

The dangers attending the giving of these injections are.—(1) Causing an abscess; (2) breaking the needle in the flesh; (3) injuring blood-vessels or nerves.

An abscess is generally the result of the use of an unsterile drug or an unsterile needle or failure to cleanse the skin properly at the point of puncture and anything which injures the tissue cells (*e. g.*, a blunt needle or an irritating drug) is a strong predisposing factor.

To avoid risk of breaking the needle in the flesh: (1) do not use a bent needle; (2) do not, if possible to avoid it, give an injection to an obstreperous patient without someone to hold her; (3) tell a conscious patient who has never had an injection what you are going to do but that it will not hurt more than the prick of a needle, otherwise, she may pull away the limb in which you insert the needle and thus break the latter; (4) do not make an injection where the needle will strike a bone.

To avoid danger of injury to vessels or nerves never make an injection along the course of the large vessels.

The sites generally chosen for subcutaneous injections, other than local anesthetics and antitoxins, are, for convenience, the outer surfaces of the arms and thighs and, for intramuscular ones, the gluteal or lumbar muscles. As previously stated, injections are not to be made in the neighborhood of the large blood-vessels or over bony prominences. Local anesthetics are injected into the part where the prevention of pain is necessary; the sites chosen for antitoxin injections are mentioned on page 466.

Procedure in preparing for and giving injections.—Collect your apparatus and choose a suitable syringe and needle. The size of the syringe will depend upon the amount of drug that is to be given, that of the needle upon the nature of the drug and the way in which it is to be given. Thus, for a small amount of clear fluid, other than a local anesthetic, the smallest needle obtainable should be used; for a local anesthetic a comparatively long needle of small bore is generally preferred, and for a thick fluid, as oil and the majority of antitoxins, a needle of large enough bore for the liquid to be forced through easily. For intramuscular injections a needle about two inches long is generally needed.

Wash your hands.

Disinfect the needle and syringe.—There are different methods of doing this. **Method 1.**—With sterile forceps[1] take a sterile sponge from the jar and lay it on the small tray. Remove the wire from the needle, attach the latter to the syringe, submerge it in the alcohol in the jar, but be careful that it does not touch the latter, and, by drawing the piston of the syringe up and down, at least five

[1] If the forceps is not kept in alcohol it is made sterile by holding it in the flame of the alcohol lamp for a few seconds.

times, alternately fill and empty the syringe.[1] Lay the syringe on the small tray with the part just below the needle resting on the sterile sponge.

An important point to remember regarding the syringe is that whatever the method used to disinfect a glass syringe the piston is never to be put into the cylinder of the syringe dry, if it is, it is likely to stick and, if any force is used to move it, break the cylinder; therefore, before inserting it, dip it into alcohol or sterile water. Neither, after use, should the syringe be put away with the piston in it unless the latter is oiled.

Method 2. Either boil the syringe for five minutes, as described in Chapter X., or disinfect it with alcohol by, at least five times, alternately filling it and emptying it, put it into the jar of alcohol. *Fill* the spoon with sterile water. Light the lamp. When the water is boiling put the needle into it, see that the wire projects beyond the end of the needle so that it will protect the point of the latter, it is well to hold the needle with the forceps when putting it into the spoon for it can then be laid down more gently than when it is dropped from the fingers and this is very important since the point is easily blunted, as a further precautionary measure cotton is sometimes wound loosely around the needle or else laid on the spoon.

If the forceps is not in alcohol hold its points in the flame for a few seconds and then put out the light.

With the sterile forceps take a sterile sponge from the jar and place it on the small tray.

Take hold of the screw end of the needle, preferably with the forceps, and connect it with the syringe.

[1] It is claimed that this method of disinfection is perfectly effectual if the needle is properly cared for after use and kept in a sterile container and this method of disinfection does not blunt the needle as quickly as boiling does.

To fill the syringe, if a glass one and **the drug is in tablet form,** remove the piston from the tube and place it on the sterile sponge. Take a tablet from the bottle, preferably with the forceps (*if the points of the latter are wet dry them on the sterile sponge before doing this*) and drop the tablet into the syringe.

Put in the piston and then draw about 10 minims of water[1] into the syringe from the spoon, be careful when doing this not to let the point of the needle touch the spoon.

Turn the syringe with the needle pointing upward and press the piston until a drop of water is ejected from the needle so that all air will be expelled.

Shake the syringe until the drug is thoroughly dissolved.[2]

If the piston of the syringe cannot be removed it is better not to attach the needle until the syringe is filled; leave about 10 minims of boiling water in the spoon, drop the tablet into this and check the boiling at the same time, crush the tablet with the point of the syringe if necessary, it must be thoroughly dissolved, draw the fluid into the syringe and be sure to take the last drop; attach the needle and expel the air as already directed.

If the drug is a liquid fill the syringe in one or other of the following ways: (1) Draw the solution into the syringe, taking a minim or two more than required, turn the syringe with the needle pointing upward and press the piston, very gently, until its lower edge is on a level with the line showing the amount required; while doing

[1] It is a mistake to use too little water, for dilution renders a drug less irritating and favors absorption.

[2] It is a common mistake to do this before expelling the air, but as a drop or two of liquid may be lost in expelling the air, it is obvious that the less the drug is dissolved before this is done the better.

this hold the mark on a level with your eye (the reason for this was given on page 448). (2) Connect the needle to the syringe and, holding the latter obliquely, pour in the drug, a minim or two more than required, and proceed as described above. This is the best method with thick liquids.

A drug that is not put up in a sterile tube or that is not diluted with alcohol or other antiseptic should, if possible, be boiled for a minute or two before use. Unfortunately, most drugs are deteriorated by heat; this is one of the objections to the use of cocaine. The drug is boiled in the same spoon or pan as the water, either before or after the needle is sterilized.

After the syringe is filled, lay it on the small tray with the part just below the needle resting on the sterile sponge; this holds the needle from contact with the tray. Take another sterile sponge with the sterile forceps, moisten it with alcohol 70%, and lay it on the tray or, for an intramuscular injection, take a bottle of iodine and one of collodion and two sterile swabs, place the latter with their covered points resting on a sterile sponge. Carry this tray and its contents to the patient.

To prepare the skin rub the part at and around the point where the puncture is to be made quite forcibly with the wet sponge, using the side that did not touch the tray, or, for an intramuscular injection, paint it with iodine.

To give a subcutaneous injection for other purposes than to produce local anesthesia, take up a cushion of flesh between the thumb and fingers of the left hand, keeping the skin as taut as possible, place the point of the needle on the skin and then insert it quickly[1] almost

[1] The puncture will cause less pain if the needle is inserted quickly than if it is introduced slowly.

vertically into the flesh (do not touch the piston while doing this or some of the fluid may be injected into the skin). Withdraw the needle slightly, so that the point will not be pressed against the tissue, and press the piston slowly so as to expel the fluid. Wait a second and then remove the needle quickly, making pressure on the skin with the sponge near the point of puncture while doing so. Massage the part for a few seconds to spread the fluid through the tissue and so hasten absorption.

To inject a local anesthetic use, as already mentioned a comparatively long needle, introduce it almost horizontally under the epidermis along the line where the incision is to be made and then start injecting the fluid and, slowly withdrawing the needle so that the anesthetic will be deposited among the nerve endings along the line of incision.

To give an intramuscular injection hold the skin of the part tense by pressing in opposite direction with a finger and the thumb of your left hand and force the needle perpendicularly, steadily, and quickly, through the skin directly into the muscle. Proceed as for an ordinary subcutaneous injection, but, after the removal of the needle, paint the puncture with collodion.

Care of syringe and needles.—A syringe and needle used for a vaccine or an antitoxin or for a patient with a contagious disease must be boiled after use, but otherwise they are generally disinfected in the manner described under their preparation by Method 1. After disinfection the needle is dried either by attaching a small bulb to the screw of the needle and blowing out all moisture or by passing air through the needle by moving the piston up and down several times alternately inserting and removing the wire, wiping the latter with a piece of clean gauze before each reinsertion. One reinsertion is usually

sufficient if air is passed through the needle. As soon as the wire is dry when removed, reinsert it and let it remain, have its point extend beyond that of the needle. It is important that the cleansing should be done as soon as the injection has been given for, otherwise, especially if a thick solution has been used, the needle may become clogged.

It is customary in some hospitals for the hypodermic syringe and needles to be kept between layers of sterile gauze in a glass jar and for the nurse who has charge of the medicine cabinet to be held responsible for boiling this jar and the one containing the sponges daily and changing the gauze and sponges. Also she is required at this time to examine the needles and see that the points are sharp and the wires in place and to test the syringe to see that it is in order. Another common custom is to keep the syringe and needles in a tightly closed jar containing 95 per cent. alcohol, especially one for use in emergency. The syringe and needle must be disinfected before being put into the alcohol, because 95 per cent. alcohol is not as good a disinfectant as 70 per cent. and cannot be depended upon for sterilization, but the water in 70 per cent. is likely to rust the needles.

If a glass syringe is not kept in alcohol, the piston must be either left out of the cylinder or, after being cleansed, be lubricated with a light oil, vaseline, or glycerine to prevent it sticking to the cylinder.

Sera. Antitoxins. Vaccines. Virus

The sera used in therapeutics generally consist of the liquid expressed from clotted blood. The blood may be that of a human being or of one of the lower animals. It is usually obtained in much the same manner as de-

scribed under Phlebotomy, page 563, but, as a rule, in the lower animals,[1] it is, for convenience, taken from the jugular vein. A serum may be normal, *i. e.*, obtained from a normal individual or animal or it may contain antitoxins or antibacterial (that will destroy bacteria) substances. **Normal horse serum** is sometimes used in hemorrhage to hasten the clotting of blood and in some diseases to increase leucocytosis; also, normal serum is used as a diluent for some vaccines and other medicinal substances.

An antitoxin serum is one that is obtained from the blood of a person or animal who has recovered from a disease, such as diphtheria or tetanus, that is associated with the formation of antitoxins. In the lower animals the disease is usually intentionally produced by repeated inoculations with what is analogous to a vaccine. The antitoxins contained in the serum are formed by the body cells in their reaction against the effect upon them of the toxins[2] produced by bacteria causing the disease from which the person or animal suffered.

It is thought that diseases which are associated with the formation of antitoxins accustom the cells to form antitoxins, a different kind for each infection, and, thus, one attack of such a disease is likely to protect the individual against further attacks, because, if similar bacteria again invade the body, the toxins they produce will combine with the antitoxins and, as they cannot then unite with the body cells, they will be harmless. If, however, blood

[1] The horse is the animal generally used for obtaining sera, because a larger amount of blood can be taken from it without causing lasting harm than from smaller animals.

[2] Space will not permit of going into the details of the nature and formation of antitoxins and vaccines; for further information see textbook of Materia Medica or Bacteriology.

containing antitoxins is taken from one individual (or animal) and the serum from it injected into another person the recipient's cells take no part in the production of antitoxins, and those introduced are either eliminated or destroyed in a short time; therefore, the period of immunity given an individual by the injection of an antitoxin serum is generally limited to a few days. Immunity gained by the receipt of an antitoxin is termed *passive immunity*, because, as just stated, the recipient's cells take no part in the production of the antitoxin, while that gained by an attack of a disease is called *active immunity*. In order that it may give immunity, an antitoxin must be administered before the toxin combines with cells. Antitoxins are also given during the course of diphtheria and tetanus so that, by combining with the bacterial toxins, they may protect the body cells from the toxins and hasten recovery. When given to produce immunity a dose is said to be prophylactic, and, when given after the symptoms of disease are manifest, therapeutic.

Vaccines usually consist of preparations of toxins, or of dead bacteria,[1] or a virus of living organisms the virulence of which has been attenuated by some means. A vaccine or virus introduced into the body has a similar, though very much weaker, effect upon the cells as the toxin produced in an attack of the disease which the vaccine or virus is used to prevent or limit. As the effects of vaccines etc. are less extensive than those of disease, the immunity they afford is not as lasting. The length of the period of immunity varies with different vaccines.

Vaccines are also used during the course of certain

[1] There are a few vaccines which are not of this nature, notably the pollen vaccine, which is a watery extract of various plants that cause hay fever.

diseases, for the administration of a suitable vaccine at proper intervals will in some infections, stimulate phagocytosis. Vaccines for this purpose are sometimes prepared from cultures taken from the patient. These are known as *autogenous vaccines*.

The majority of sera and vaccines other than the smallpox virus are given either as intramuscular, intravenous, or subcutaneous injections, but certain sera are introduced into the spinal canal, following lumbar puncture, and others, especially tetanus antitoxin serum, are injected at the site of infection. Those given subcutaneously are not, as a rule, given in the sites mentioned on page 458, because there is usually a considerable amount of serum given at a time, and, therefore, a location is chosen where there is a relatively large amount of loose tissue that is poorly supplied with nerves. Such parts are below the breasts, about an inch below the center of the clavicle, the posterior portion of the axilla, the upper portion of the abdominal wall.[1] The syringe is sterilized and the skin disinfected in the same manner as for intramuscular injections, otherwise the procedure for such subcutaneous injections is the same as when small amounts of liquid are used in the sites mentioned on page 458. These injections are almost always given by a doctor.

Smallpox virus is given either by injection or by inoculation, or scarification.

Scarification. Inoculation with Smallpox Virus

By scarification is meant scratching or making a few small superficial incisions in the skin in order to remove the epidermis (which inhibits absorption) and expose the

[1] A nurse should never give an injection in this location.

derma for the application of, as a rule, smallpox virus or a vaccine or similar preparation used for some of the immunity tests, such as the tuberculin test and the tests for protein sensitiveness described in Chapter VIII.

A special instrument known as a scarifier is generally used for scarification, but if one is not to be had a large sewing needle or scalpel is substituted. Whatever the instrument used, it must be sterile.

For inoculation with smallpox virus two small[1] areas of skin (about ¼ inch in diameter) about an inch apart, are scarified deeply enough to draw serum, but not blood, and the lymph containing the virus is deposited within the areas and rubbed in with the side of the scarifier, or the tip of a sterile dropper, or other instrument. The lymph is allowed to dry and the part is then covered with a small cap or compress of sterile gauze. In some States, the Board of Health provides sealed tubes containing an ampule of lymph and a scarifier sterilized ready for use. The operation is generally performed by a doctor and the nurse's usual duties consist in preparing the necessary appliances and the patient's skin. The latter is sometimes disinfected by painting it with iodine, but some doctors consider that the iodine affects the virus and prefer that the preparation consist of washing the skin with (1) soap and water, (2) ether, and (3) alcohol. It is to be remembered that failure in asepsis is likely to result in a serious infection.

Anaphylaxis.—Following the use of a vaccine or virus there is normally, if the treatment is effectual, a varying degree of malaise, but, ordinarily, the use of an antitoxin

[1] This is not, as is very generally thought, in case one is not effectual, but because one scar will not supply sufficient toxin. The organisms in the virus remain at the point of inoculation and there form the toxin which is carried through the body by the blood.

or of a normal serum is not followed by any marked discomfort. Some people, however, are very easily influenced by certain kinds of proteins and in such quite a serious condition may sometimes result; this is known as *anaphylaxis* or *serum sickness*. The following are common symptoms of such disturbance: Fever, headache, asthmatic attacks, edema in various parts of the body, urticaria, and, when the condition is severe, collapse. It has been found that many people who are easily affected in this way by sera are also susceptible to certain food proteins or the protein in the pollen of some plants. Such sensitiveness is manifested in different ways; for examples, an outbreak of hives or an attack of asthma after eating eggs, fish, or whatever food contains the protein to which the person has become sensitized, or, when it is a pollen protein to which the individual is sensitive, attacks of hay fever or hay asthma after exposure to the pollen.

Demonstration 80

Inhalations

Requisites.—1. Nitrite of amyl and a gauze compress.

2. Stramonium leaves; a bowl; stiff paper or cardboard with which to make a cone as described on page 470; pins.

3. Apparatus for oxygen inhalations, this consists of a tank of oxygen; a thick glass flask with a wide neck into which is fitted a cork with two holes and, in each hole, a curved glass tube one of which extends about an inch into, and the other almost to the bottom of, the flask, water enough in the flask to about half fill it; two pieces

of rubber tubing, one of which is about thirty-six inches long (it must be long enough to reach from the flask to the patient's mouth) and the other long enough to connect the flask and tank (the length necessary will depend upon where the flask is placed, sometimes this is on a table put near the tank, but some tanks have an attachment for the flask and in such case the tubing need be only a few inches long); a funnel.

4. A Maw's inhaler and bath towel or whatever form of inhaler the hospital supplies for direct steam inhalations.

5. Apparatus for steam inhalations with a tent; this usually consists of a kettle with a long spout (commonly known as a *croup kettle*, because this treatment is frequently used for the relief of croup); a screen or other foundation for the tent; a piece (about half) of an old blanket; two sheets; pins; a stove; a stand for the latter and, if necessary, something to protect this from the heat.

Nitrite of Amyl Inhalations

Purposes.—To relieve spasmodic contraction of the bronchi in asthma and of the coronary arteries in angina pectoris. Amyl nitrate produces these effects by relaxing the plain muscle tissue of the bronchi and coronary vessels.

Procedure when giving a nitrite of amyl inhalation: Break a pearl,[1] or else pour the amount of drug prescribed (usually five drops) from the bottle on to a gauze compress and hold this a short distance above the patient's nose and mouth. Keep it thus until the symptoms for which it is given are relieved or the drug has evaporated. Be careful while doing so not to inhale the

[1] Pearls are small capsules of thin glass in which, for convenience in using it, the drug is sold.

drug yourself for it causes dilation of the arteries and, when this is not necessary, headache, dizziness, faintness, and other unpleasant effects may follow.

Stramonium and Belladonna Inhalations

Purposes.—*Stramonium and belladonna* are given by inhalation to relieve asthmatic spasms, because these drugs are absorbed by the mucous membrane with which they come in contact and, by depressing secretory and bronchial motor nerve endings, they lessen the secretion of mucus and the contraction of the bronchial muscle. When the drugs are given in this manner, leaves containing them are burned and the smoke inhaled. The leaves may be bought prepared in the form of cigarettes or loose. Stramonium and belladonna cigarettes are smoked in the same manner as those of tobacco, but the patient is instructed to inhale as much of the smoke as possible. If the leaves are loose, place them in a bowl; make a cone of paper or cardboard the largest end of which will fit around the bowl, set fire to the leaves, put the cone over the bowl and have the patient inhale the smoke through the free end.

Oxygen Inhalations

Purposes.—(1) To increase the tension of oxygen in the alveoli (*air-sacs*) of the lungs and thus favor the passage of larger amounts into the blood; (2) to improve the heart action. Oxygen inhalations are used in conditions that interfere with the aëration of the blood, such as abnormal conditions of the lungs and air passages; heart failure; and abnormal conditions of the blood, such as are caused in gas poisoning and by poisoning by drugs that, like the carbon monoxid of illuminating gas, combine with the hemoglobin, or that cause hemolysis.

Under ordinary conditions the amount of oxygen that can be absorbed by the blood is determined by (1) atmospheric pressure—at high altitudes, where the atmospheric pressure is low, less air enters the lungs: (2) the amount of hemoglobin in the blood; oxygen is not very soluble in blood plasma and thus, ordinarily, there is only a very small amount free in the plasma, i. e., uncombined with hemoglobin, but when oxygen enters the lungs under pressure and not, as in the air, diluted with nitrogen, it tends to diffuse much more freely through the lungs and into the blood and a larger quantity goes into solution in the blood plasma.

The reason for the results of the inhalation of oxygen on the heart action is not definitely known, it is believed they may be partly due to reflexes induced by irritation of the mucous membrane and partly to the increased tension of the oxygen in the blood. The inhalation of oxygen by normal individuals has no effect on the breathing nor on metabolism, but it regularly reduces the rate of the heart action and tends to increase the blood-pressure in the arteries.

Oxygen for therapeutic uses is bought in steel containers. For administration it is passed through water with two objects in view, (1) to gage the amount of gas being used, this is determined by the size of the bubbles; (2) to moisten the oxygen and thus prevent the intense drying and irritation of the mucous membranes that pure oxygen tends to promote. As a further means of preventing this the air around the patient is sometimes kept moist with steam as described in the section following.

To give an oxygen inhalation.—Stand the oxygen tank near the head of the bed; fill the glass flask half full of water, insert the cork with the glass tubes as described on page 469, connect the longest of these tubes with the tubing extending from the oxygen container and the shorter one with tubing that is long enough to reach

from the container to the patient's mouth, insert a funnel in the free end of this tubing. Turn the key of the container sufficiently to start the oxygen flowing through the bottle at a rate that will form *small* bubbles in the water. Do not hold the funnel over the bed until you have the flow of gas adjusted for, if too much is allowed to enter the bottle, water may be blown through the tubing. When the flow is regulated, hold the funnel near the patient's nose and mouth, not too close, or the air exhaled by the patient will strike against the funnel and be thrown back.

Steam Inhalations

Purposes.—(1) To relieve spasmodic contraction of the bronchial muscle, as in croup; (2) to improve the condition of the membrane lining the air passages; (3) to facilitate expectoration; (4) to, by moistening the air, aid the absorption of oxygen. Volatile drugs, such as ticture of benzoin and oil of eucalyptus, which stimulate the mucous membrane and act as expectorants are often added to the water that is to be vaporized.

Methods.—Steam inhalations may be given with the apparatus so arranged that the exit for the steam is in as close proximity to the mouth as the heat of the vapor will permit or a large kettle may be used and placed at a slight distance and a canopy or tent arranged above the bed, over the patient's head and shoulders, so as to direct the steam toward the patient in a manner that will allow of its being inspired.

The Maw's inhaler[1] is a commonly used type of in-

[1] This is a carafe-shaped utensil, the top of which is fitted with a cork that has a hole in the center into which a mouthpiece fits and at the side of the flask there is a hollow projection through which air enters and forces the vapor upward.

haler for a close inhalation. To use one: Heat the utensil by pouring hot water into and over it. Pour out this water and then pour in enough boiling water to reach the lower level of the opening of the air channel (the water must not cover this); add the drug that has been prescribed; insert the cork with the mouthpiece attached; wrap a piece of heavy flannel or a bath towel around the inhaler, leaving the mouth piece and the air tube free.

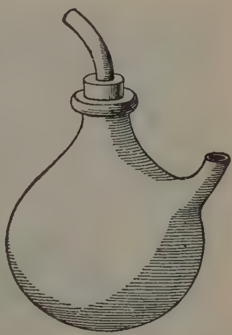

Fig. 49. Maw's inhaler.

Arrange the patient, lying or sitting, in a comfortable position and place the inhaler so that she can hold the mouthpiece in her mouth without effort. If the inhaler is properly protected and the water boiling when it is put in, it will keep hot enough for vapor to continue to ascend for fifteen or twenty minutes.

An ordinary pitcher is sometimes used instead of a Maw's inhaler, but for obvious reasons, it is not as good.

The procedure in preparing for a steam inhalation in which a canopy is used depends upon the nature of the frame provided, but the essentials are: 1. That the roof of the canopy be lined with a piece of old blanket or other material that will absorb moisture readily, otherwise, if the room is cool, the moisture may condense and drop on the patient or bedclothes.

2. The stove is to be placed where there is no danger of the bed-covers coming in contact with it or else a guard should be put around it.

3. The spout of the kettle must not project far enough under the canopy for it to come in contact with the patient.

4. The canopy is to be neatly arranged and must not exclude the air.[1]

In Figs. 50 and 51, the canopies are made over iron frames which are attached to the upper bars of the bed by means of curved hooks.

To arrange a canopy as in Fig. 50, cover the frame with a piece of blanket and this with a doubled sheet, pleat the

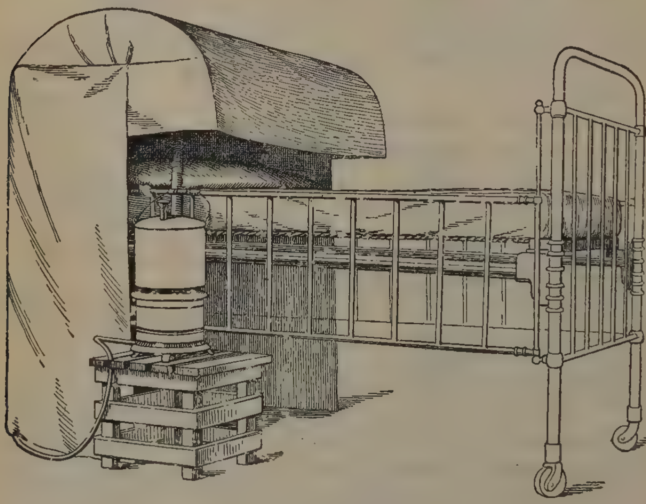

Fig. 50. Croup tent.

sheet at the sides and pin it in such manner that it will fit snugly over and around the frame as in the illustration, double another sheet and pin it to the first around the back and sides, as shown in the illustration.

[1] It is a common error in arranging these canopies to surround the patient too completely in the hope of localizing all the steam possible, but, in conditions calling for such treatment, the patient needs an extra, and not a restricted, supply of air.

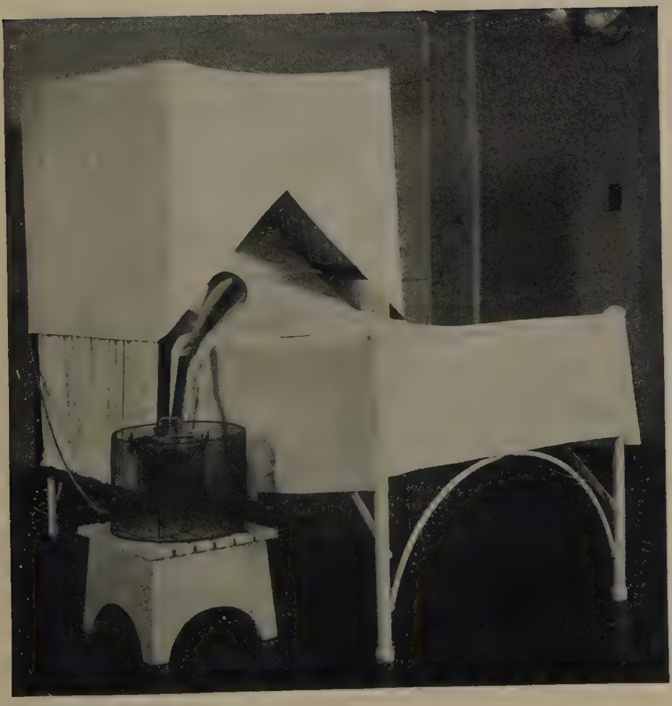

FIG. 52.—CROUP TENT IN WHICH A SCREEN IS USED FOR THE FOUNDATION.

To adjust a canopy like that in Fig. 51, spread two sheets on a table, right sides together, pin them down the center, putting the pins not more than one half inch apart; fold each sheet back upon itself; cover the top of the frame with a piece of old blanket, pin it over the bars of the latter. Drape the sheets over the frame and around the bed as shown in the illustration, do not put the pins,

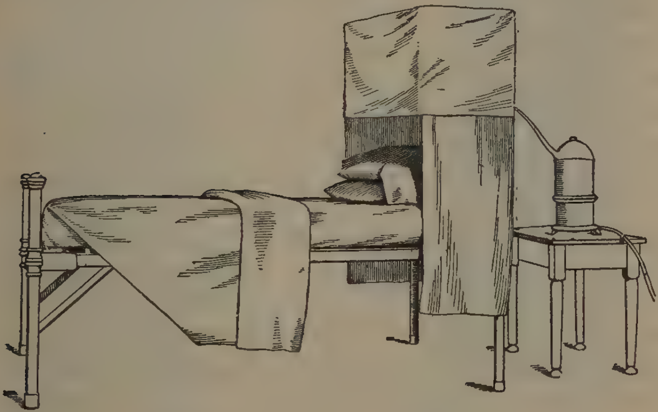

Fig. 51. Croup tent.

especially at the top of the side fold more than an inch apart, and stick them through the sheet into the blanket allowing only the heads to show. Remove one or two pins from the seam to allow for the entrance of the spout; this must be at a distance from the patient's head and the spout must not be inserted more than half an inch.

To use a screen as a foundation stand one, or two if necessary, behind the bed with the wings projecting around the sides; tie a piece of bandage or heavy cord across the front from the upper point of both wings (to act as a support for the canopy) pin a piece of blanket across

the top, pin two sheets together as for the preceding method and drape this over and around the screen as shown in Fig. 52.

A large bed cradle can also be used as a foundation. To use one, stand it on one end at the head of the bed, behind the pillows, tie it to a bar of the bed to secure it in place, pin a piece of blanket so that it will be stretched tightly across the top and arrange sheets over the top and around the sides as in either Fig. 50 or Fig. 51.

Fill the kettle to about three quarters its capacity with boiling water and place it in position. Do not add the drug to the water until the latter is boiling and be careful not to put it near the flame for almost all drugs used for this purpose are very inflammable.

Fig. 53 shows a method that is used when nothing can be obtained for a larger foundation. The tent consists of a cradle placed on a table and surrounded, except in front, with a rubber sheet and, over the latter, a folded cotton sheet. A wooden box with one end (for the front) cut out can be substituted for the cradle and rubber for home use.

Demonstration 81

Application of Medication to the Throat

Requisites.—1. Tongue depressors.

2. Swabs.
3. Receptable for used swabs.
4. A small glass.
5. A bottle containing the drug or, for class, water.

The pupils should take turn in being *patient*, or else, standing in front of a mirror, each one should go through the procedure on herself.

FIG. 53.—A METHOD OF GIVING A STEAM INHALATION.

The principal points to be considered are.—To depress the tongue properly; to thoroughly swab the affected parts, but, if an irritant drug is used, not other parts of the mouth and throat.

To depress the tongue properly means that the curve at the back, which hides the lower part of the pharynx, is to be lowered without touching the back of the throat as this will gag the patient; therefore, get the patient in a good light and put the tip of the depressor upon the highest part of the curve and press it downward.

Procedure.—Pour a little solution into the glass, arrange the patient so that the interior of the throat will be well lighted (see Chapter X.), wet a swab—do not take up so much liquid that it will drop in the mouth—depress the tongue, pass the swab over the affected parts with considerable pressure.

Demonstration 82

Application of Medicine to the Eyes

Requisites.—1. Medicine dropper.[1]

2. Swabs.

3. Receptable for used swabs.

4. Drug that is to be used; this, for class, can be boric acid, 2%, or sterile water.

Procedure in applying drops to the eye.—Place the patient with her head tilted slightly backward and comfortably supported; take up as much of the drug in the dropper as required, but leave the latter in the bottle. Draw down the lower eyelid with the first finger of your left hand and tell the patient to look upward. Take

[1] Special droppers with flat rims are to be had for this purpose. but ordinary ones will answer the purpose.

the dropper in your right hand and, holding it slightly above, but not touching[1] the eye, make very slight pressure on the rubber nipple so that the number of drops prescribed will fall on the inner surface of the lid. Release the lid slowly and tell the patient to close her eye. The medicine applied in this way will enter the eye quite as well as if it is dropped directly on the eyeball and cause less irritation. Place a finger against the inner canthus (the inner angle between the eyelids) for a minute, to prevent the drug flowing into the nasal duct. There are two reasons for this (1) to keep the drug where it is wanted, (2) if the drug enters the duct a larger amount will be absorbed than from the eye and this may cause the conditions of an overdose of the drug.

[1] On no account should the dropper be allowed to touch the eye for the cornea is very easily irritated and injured.

Mon Nov. 8/6

CHAPTER XVI

Counterirritants and Other External Applications

Nature of counterirritation and hyperemia. Nature, uses, and classification of counterirritants. Methods of preparing and applying poultices, fomentations, liniments, ointments, plasters, cold applications. Use of the cautery and flatiron to produce counterirritation. Cupping. Means of applying bandages to induce hyperemia.

External applications to the skin are made to obtain both local and systemic effects. A large proportion of the drugs and agents used for the latter purpose do so by counterirritation.

By counterirritation is meant, in a restricted sense, *an irritation produced to relieve an existing irritation*, but the term is also used when the irritation is produced to relieve other conditions as, for examples, nausea; flatulence; collapse due to depression of nerve centers, especially that caused by narcotic drugs; and the local effects described later.

The agents most commonly used as counterirritants are: (1) Irritant drugs, such as mustard, iodine, chloroform, guiacol, various antiseptic irritant preparations used on ulcers and the like, and cantharides. (2) Heat which, for this purpose, is generally secured by the use of hot-water bags, electric pads, poultices, stupes, foot-baths, the cautery or flat iron, cupping. (3) Local cold applications are sometimes classed as counterirritants.

According to the severity of the local effects that they

are used to produce, **the drugs employed as counter-irritants are classed as** rubefacients, vesicants, and escharotics.

Theories regarding the manner in which counterirritants influence parts of the body remote from the area of their application.—Though the practice of applying irritant agents to the skin for the relief of abnormal conditions in the internal organs is one of great antiquity, the way in which they have this result has not as yet been positively determined. For many centuries it was supposed that disease was due to malignant humors and that a counterirritant afforded relief by drawing the causative humor from the affected organ to the skin. Later it was suggested that the abnormal condition was associated with congestion in the affected viscus and that the relief of pain was due to the withdrawal of blood from the viscus to the skin. This theory, in more or less modified form, has persisted until recent times, but it has been demonstrated that, except when a large surface of the body is exposed to the treatment, as in hot sitz baths, hot foot baths, and the like, the increased influx of blood to the irritated area is not sufficient to affect the amount in organs whose blood-vessels are not directly connected with those in the irritated area. Therefore, **it is now believed that the relief of abnormal visceral conditions by external irritant applications is due** to the stimulation of afferent nerve-endings and, in some cases, partly to suggestion. **How the stimulation of afferent nerve-endings affords relief** of pain, etc. is not positively known, but it is believed that the nerve-fibers entering the spinal cord from a viscus form synapses in the same masses of gray matter as the fibers entering from the external tissues over the viscus and it is conceived that impulses induced by irritation of the skin over an organ, by occupying the

same pathway to the brain as impulses coming from the viscus, exclude the latter and, in this way, overcome sensations of pain and, if the stomach is the affected organ, nausea.

It is to be recalled that sensations are perceived and interpreted in the brain and that sensation is merely referred by the brain to the parts containing the nerve-endings whose stimulation gave rise to the sensation or, when the stimulation arises in a viscus, to the surface of the body over the viscus in which the nerve-endings were stimulated—sensations are rarely referred to the internal organs.

Also, it is thought that **impulses coming from a localized area of the body as the result of irritation are transmitted to** efferent fibers arising in the gray matter of the anterior horns of the cord on the level that the impulses entered and that these impulses then pass to the organ under the irritated area and cause contraction of its blood-vessels, thereby improving the circulation in the organ and lessening congestion and, when the irritant is over the abdomen, peristalsis is stimulated, which causes the expulsion of flatus.

Nervous connection of more or less distant parts of the body is not confined to the viscera and overlying tissues, for several parts of the body are supplied by branches of the same nerves and this is thought to account for the relief of pain by the application of irritants to parts more or less remote from the seat of disturbance, for instances. a blister behind the ear often relieves the pain of facial neuralgia, and a blister over the temple may mitigate the pain associated with iritis (*inflammation of the iris*).

Local effects of counterirritants.—These depend upon the degree of irritation. Irritation from any cause induces a relaxed condition of the blood-vessels and therefore an influx of blood into the area. Therefore, a moder-

ate degree of irritation by a counterirritant causes a feeling of warmth in the part and the skin becomes red and congested, the increased supply of blood in the part is, of course, associated with an increase in the number of leucocytes. A sensation of itching and, later, of burning and even actual pain may be experienced, though the sensation is usually afterward lessened, as the nervous mechanism involved becomes fatigued by the excessive stimulation.

The local conditions promoted by a rubefacient (1) improve the circulation in the part and thus favor the nutrition of its cells; (2) provide an increased number of leucocytes to fight bacteria and to aid resolution;[1] (3) favor absorption of exudates. Therefore, for their local effects, rubefacients are very commonly used to overcome conditions associated with superficial chronic inflammations and, in the treatment of ulcers and sluggish wounds, antiseptic irritants are used to stimulate the growth of new tissue.

If irritation is prolonged or severe the rubefacient stage is likely to be followed by vesication or blistering, in which circumscribed areas of the epidermis become detached from the derma by the fluid exuding from the congested blood-vessels, thus forming blisters. The consequences of this vary with (1) the degree of blistering (2) the nature of the irritant; and (3) the treatment of the blisters. Blisters caused by strong irritants, such as intense heat and mustard, are likely to be followed by destruction of the tissue and suppuration, those caused by substances such as cantharides, if not severe and if properly treated, will not injure the tissues. If a blister is not opened the fluid is gradually absorbed and the

[1] If these terms are not understood see the section on the functions of the white corpuscles in a text-book of Anatomy and Physiology.

outer wall dries and rubs off as new epidermis forms, if the cover of the blister is punctured, so that the sensitive derma is exposed, the transudation of fluid continues until a new epidermis. If the blister is punctured the lesion must be treated aseptically or suppuration may follow.

Cantharides is the vesicant commonly used. It is employed chiefly in (1) chronic inflammations for its local therapeutic effects, which are the same as those obtained by rubefacients, but more prolonged, since the cantharides can be left in contact with the skin for several hours; (2) the relief of pain in neuralgia and neuritis, the cantharides is applied over the course of the affected nerve or, sometimes, over a branch of the affected nerve.

Very strong irritants, such as concentrated acids and alkalies, *e. g.*, sodium hydroxid, tend to destroy tissue to which they are applied and therefore termed **escharotics.** These are used chiefly for the destruction of abnormal growths, such as warts, and to cauterize and disinfect local lesions following severe infections as rabies; also silver nitrate, which is a mild escharotic, is used both to destroy superabundant granulations and to stimulate the tissue of a wound, which it does by virtue of its irritant action as described under rubefacients.

Actions and uses of heat.—Heat (1) induces hyperemia, *i. e.*, an increased amount of blood in the part to which it is applied and this, as previously stated, improves the circulation in the part, promotes the absorption of exudates, and increases the number of leucocytes in the area; (2) it increases the activity of the leucocytes; (3) it increases the activity of bacteria; (4) it softens tissue; (5) it stimulates afferent nerve-endings and thereby, in the same manner as the drug rubefacients, it lessens pain and congestion in internal organs and, by lessening congestion, improves the circulation and favors the ab-

sorption of exudates in a cavity under the area of its application. (6) When heat is applied to a considerable area of the body it may lessen congestion in other parts because of the greatly increased amount in the area subjected to the heat.

In chronic non-suppurative inflammations, such as often persist after injury to, for example, joints, the effects of the hyperemia induced by heat and the softening of the tissues are often of great benefit, but in acute inflammation due to bacteria heat has to be used with caution because the softening of the tissues and the increased activity of bacteria promoted by the heat favor suppuration. When, however, suppuration is inevitable hot applications are commonly used to hasten the process and to relieve pain. **The relief of pain at the area of a hot application is due to** (1) softening of the tissues, which lessens the pressure upon nerve-endings, and (2) the dilution of bacterial toxins by the increased amount of blood in the part.

Body tissues are not good heat conductors and, therefore, a hot application on the exterior of the body will not increase the temperature in a body cavity, therefore heat can be used to obtain reflex results, even when the internal inflammation is due to bacteria, as in penumonia, without danger of promoting suppuration.

Other means of inducing hyperemia.—Hyperemia is sometimes induced for the relief of both chronic and acute external inflammations by the use of what are known as Bier's cups (*called after the inventor*) or a rubber bandage.

Hyperemia induced by these means has the same effects as that promoted by heat, but the other effects of heat, softening of tissues and increased activity of bacteria, are not produced and thus these methods do not favor suppuration.

This means of inducing hyperemia is sometimes used over infected wounds, abscesses, and the like, because pus as well as blood, is forced to the surface.

Cold Applications

As explained in the section describing cold baths, cold is a protoplasmic depressant, but it stimulates the nerve-endings in the skin known as the cold spots and thereby causes muscular contraction.

Actions of local cold applications.—(1) At the area of its application cold lessens the sensitiveness of nerve-endings, except the cold spots, and thus reduces pain; (2) by stimulating the cold spots it induces reflexes that promote the contraction of muscle tissue, including that of the blood-vessels, both in the area of its application and in parts connected with the area through the nervous system, as described in Chapter IX., therefore, a local cold application will lessen congestion and check hemorrhage (*by contracting the blood-vessels*) both at the point of its application and in viscera below the area. The effect on the viscera is due entirely to reflexes because cold, like heat, does not penetrate the tissues to any considerable depth. (3) By lessening the amount of blood in a part, as well as by its depressant action on protoplasm, cold, if its use is long continued reduces the vitality of the tissue to which it is applied; (4) it lessens the activity of bacteria and thus tends to inhibit suppuration; (5) when applied over the heart, cold lessens its activity and slows its action.

Local cold applications are used to.—(1) Relieve the pain and congestion associated with inflammation; (2) to check hemorrhage, both external and internal; (3) to lessen discoloration in bruises (*by checking capillary*

hemorrhage into the tissues to which the discoloration is due); to overcome headache (*by lessening cerebral congestion);* to slow and quiet the heart action.

As cold interferes with cell nutrition **the long continued use of intense cold** upon injured or inflamed parts may be injurious, but when the abnormal part is deeply seated the use of cold applications can usually be continued indefinitely, provided it is not too intense, because normal cells can generally withstand its depressant effect. However, this may not be the case when general nutrition is interfered with, as in the aged and diabetic patients.

Signs that cold is having an injurious effect are.—Numbness and stiffness of the part and a mottled bluish discoloration due to interference with the venous circulation and consequent passive congestion.

It is to be remembered that **if cold applications are discontinued** the reaction effects described in Chapter IX. will occur and, though in some conditions, these are exceedingly beneficial in others they may be harmful, therefore, when a continuous cold application is prescribed it must be kept cold, for example, ice-caps must be refilled before all the ice has melted.

Demonstration 83

Preparing and Applying Poultices

A poultice, or cataplasm, is a soft, hot, moist paste for external application. Anything that can be made into such a paste and that retains heat well may be used for the purpose, but flaxseed, or, as it is sometimes called, linseed, is usually preferred for it answers these requirements particularly well. Antiphlogistin or the *clay poultice* (*a preparation consisting of kaoline, glycerine,*

boric acid, oil of peppermint, methyl salicylate, and thymol) is also considerably used.

Requisites for demonstration.—1. Flaxseed.

2. Baking powder or sodium bicarbonate.

3. Mustard.

4. Boiling water.

5. Cup measure.

6. Utensil provided for cooking poultices in.

7. Stove.

8. Spatula.

9. Tablespoon.

10. Towel.

11. Board[1] or large platter.

12. Oil muslin or flannel cut the size and shape[2] required for the poultice.

13. Binder and pins.

14. Gauze or thin muslin on which to spread the poultice. For a square or oblong poultice this can be cut twice the size that the poultice needs to be, plus about three inches to allow for turning over the edges of the paste, which is spread on one-half of the material and covered with the other half, but when any complex shape is needed (*e. g.*, for the chest) it is well to have fairly firm muslin for the foundation and gauze or thin muslin for the cover and to cut these the required shape. See Fig. 54. Cut the foundation two and the cover three inches larger on all sides than the finished poultice needs to be.

15. A quilted pad with which to cover the part after the removal of the poultice. This is usually made of

[1] A board about eighteen inches aquare and one half inch thick.

[2] Poultices for the chest intended to influence the lungs should be shaped as in Fig. 54, that they may fit around the neck and extend over the sides.

wadding or non-absorbent cotton covered with gauze. It should be the shape of the poultice.

16. Oil or vaseline and a gauze or cotton sponge to apply it with and a dish to put the latter in after use.

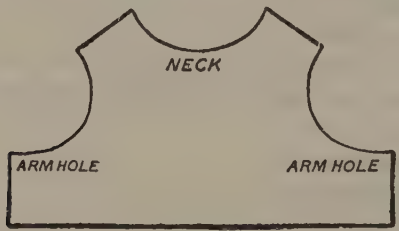

Fig. 54. Shape of poultice to cover chest.

The points of special importance to consider when making a poultice are.—To have it as light as possible and as hot as it can be used without burning the patient; to make it of a consistency that will allow of its being

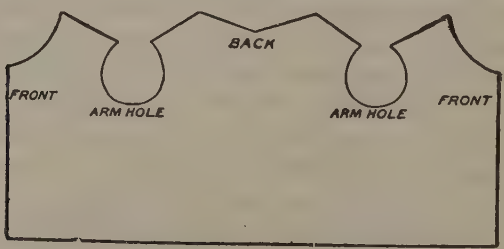

Fig. 55. Shape of binder to retain poultice in place.

spread easily, but not so thin that it will spread of itself and thus run from the covering.

Gas and air are poor heat conductors and therefore their incorporation in a poultice aids in the retention of its heat. They also expand the material of the poultice and thus prevent it being heavy and soggy. Air is in-

corporated by beating the poultice and gas (CO_2) by the use of sodium bicarbonate or baking powder. Light weight is particularly essential for poultices used to cover the chest, for a weight on the chest will interfere with breathing, thus poultices for the chest are not made more than about ¼ to ½ of an inch thick, those for other locations may be about ¾ of an inch.

Flaxseed Poultice

Procedure.—Put the water to boil (about one and a half pints will be required for a medium-sized poultice for the chest).

Spread a towel on the board and on this lay the oil muslin or flannel; cover the latter with the gauze or muslin on which the flaxseed is to be spread.

When the water is boiling forcibly, add flaxseed to it slowly (do not allow the water to stop boiling), and stir the mixture with the spatula as you do so.

When the paste is just thick enough for some dropped from the spatula to retain its shape for a minute add about one third of a tablespoonful of baking powder or sodium bicarbonate and beat the mixture thoroughly.

Turn the poultice on to the muslin and fill the pan with hot water.[1]

Spread the paste on the muslin to within two inches of the edges as quickly as possible. Turn up the edges of the muslin over the paste.

Cover the latter and turn the edges of the cover between the foundation and protector (*i. e.*, the oil muslin or flannel).

Fold the poultice, including the protector, and wrap the towel around it.

[1] If the flaxseed is allowed to dry in the pan the latter will be much harder to clean.

Wash and put away the cooking utensils.[1]

Carry the poultice (folded in the towel) and the binder and pins to the patient.

To apply the poultice.—Turn back the bed covers as much as necessary and slip the binder under the part to which the poultice is to be applied.

Turn back the nightgown as much as required and if the patient is old or a small child rub some oil or vaseline over the area to which the poultice is to be applied. Cover the part with the towel that is around the poultice.

Test the temperature of the poultice with the back of your hand.

Slip the poultice under the towel, but do not unfold it all at once. Keep raising and lowering it until the patient becomes accustomed to the heat. Notice the color of the patient's skin and judge by this, rather than the patent's opinion, if the poultice is too hot. If it does not cause a very intense redness,[2] spread it out over the part, remove the towel, and secure the binder; do not, however, fasten it tightly around the chest, as this may interfere with breathing.

Fold the towel and keep it to roll the poultice in when the latter is removed.

A poultice should not be left on longer than three quarters of an hour for by that time it will be no hotter than the skin and thus of no further value.

[1] If the poultice is boiling when turned on the muslin and spread quickly and the utensil washed and put away speedily, it is quite possible for this to be done before the poultice is cool enough to apply.

[2] This should always be the guide when making hot applications of any kind because some skins will blister much more readily than others, and, if a patient is in pain, heat, even intense enough to burn, may be a relief, while on the other hand, some patients will object to even a moderate degree of heat.

To remove a poultice.—Take the quilted pad or a fresh poultice, towel, oil, and pledgets to the bedside. Cover the poultice that is on the patient with the towel, moving the bed covers and nightgown out of the way as you do so.

Remove the poultice from under the towel and dry the skin by rubbing your hand over the towel.

Look at the skin and, if it is very red, rub some oil over it.

Put on the pad or fresh poultice and when it is in place remove the towel and wrap it around the poultice that is to be taken away.

Mustard Poultice

To make a mustard poultice.—Proceed as for a plain flaxseed poultice, but dissolve some mustard in tepid water, using for an adult one tablespoonful of mustard for each cup of flour, and for a child half this amount of mustard, and, just before adding the baking powder or soda, pour in the dissolved mustard.

For the reasons given under Sinapisms, when mustard is added to anything the temperature of a flaxseed poultice, the counterirritant action of the mustard is much diminished, but it does add slightly to that of the poultice.

Antiphlogistin Poultice

An antiphlogistin poultice, because of its ingredients other than the kaoline and glycerine, was formerly thought to have special counterirritant action in addition to that due to heat, but this is now considered doubtful. Its glycerine, however, extracts water and may thereby lessen swelling.

To prepare an antiphlogistin poultice put as much of the material as will be required into a bowl or jar, cover this and stand it in a pan of boiling water. Keep

the water boiling until the antiphlogistin is considerably hotter than could be borne by the skin (to allow for cooling), mix it thoroughly, and then spread it on a piece of muslin.

Apply it in the same manner as a flaxseed poultice; use a bandage or binder to retain it in place, and, in order to maintain its temperature, put a hot-water bag or electric pad against it, or, if these would be too heavy, protect it with oil muslin or flannel in the same way as a flaxseed poultice.

When it was considered that the ingredients of antiphlogistin had counterirritant value, it was customary to leave the poultice in place until it began to be uncomfortably dry, which, usually, is not for several hours; but it is now sometimes removed when it becomes as cool as the skin, which, unless the poultice is covered with an electric pad or hot-water bag, may be in about three quarters of an hour.

Demonstration 84

Preparing, Applying, and Removing Mustard Sinapisms

Requisites.—1. Mustard leaves.
2. Mustard.
3. Flour.
4. Tepid water.
5. Oil.
6. Bowl.
7. Spatula.
8. Tablespoon.
9. Plate.
10. Gauze.
11. Two towels.

12. Basin of warm water.
13. Wash cloth.

These will not be needed until the paste is to be removed.

Mustard is used as a counterirritant in baths, poultices, and sinapisms.

The counterirritant action of mustard is due to a volatile oil which is developed in the mustard by the influence of a ferment when the mustard is wet. This ferment is destroyed by a temperature of 140° F. (60° C.) and its action inhibited at a considerably lower temperature so that if mustard is added to a substance with a temperature above about 106° F. the amount of oil developed (and hence the counterirritant action of the mustard) will be limited. The ferment seems to become less active when mustard is kept for any length of time, especially in hot weather, and thus in summer and in hot countries it is usually necessary to use relatively more mustard for sinapisms and baths than in cold weather.

The sinapisms in common use are mustard leaves and pastes.

Mustard Leaves

Mustard leaves as bought consist of mustard combined with resinous material which holds it to a paper or muslin foundation.

To prepare a leaf for use, dip it in tepid water, fold it in a gauze compress, arranging the latter with only one thickness over the mustard surface. Lay the leaf, mustard surface uppermost, on a folded towel. Leave this towel in place when you apply the leaf as it will protect the patient's nightgown and the bed covers from the moisture. It is rarely necessary to secure a sinapism in place and, usually, it is better not to do so as, if it is loose,

the color of the skin can be more easily watched, which is imperative, for mustard blisters some skins very readily.

Remove the leaf when the skin is well reddened. This is usually in about ten or fifteen minutes, but, sometimes, in five or even less. Wash the skin with warm water and dry it. Make sure that no particles of mustard adhere to the skin for, if this happens, blisters may be formed. If the skin is very red, apply some oil or other lubricant and cover the part with a gauze compress or soft muslin.

Mustard Pastes

Mustard pastes are usually made of mustard, flour, and tepid water, and, sometimes, oil is added for it inhibits blistering. The relative proportion of mustard to flour required varies for the reasons given on page 493. Ordinarily, in a temperate climate, about one part of mustard to three or four of flour is necessary for an adult and one to six or eight for a child. About five tablespoons of material are needed to make a paste six inches square.

Procedure.—Put the mustard in a bowl; crush all lumps.

Add the flour and mix the two ingredients thoroughly.

If oil is to be used, add about two teaspoonsful.

Add enough tepid water to make a paste that can be spread easily, but that will not run.

Lay a gauze compress on a plate and spread the paste in the center of the former, about one eighth inch thick. Fold the edges of the gauze over the back of the paste.

Place the paste, the side with single layer of gauze uppermost (this is the side that goes next the skin), on a folded towel. Put it on the patient and take the same precautions while it is on and when removing it as for a mustard leaf.

Demonstration 85

Application of Stupes or Fomentations

Nature.—A stupe or fomentation consists of flannel or other soft material wrung out of very hot water for the purpose of supplying external heat to a part of the body.

Requisites for abdominal stupes, Method 1:

1. A gas or electric stove and a tray on which to stand this and, if the table on which this is to stand will be injured by heat, something (as wood or a folded towel) that is a poor heat conductor to put under the tray.
2. Matches, if necessary.
3. A basin of boiling water.
4. Oil muslin.[1]
5. Three pieces of flannel twice the size of the area for application.
6. A heavy crash towel or stupe wringer.[2]
7. A blanket or shoulder protector.
8. A rubber, if required.[3]

Requisites for Method 2.—The same as for Method 1 with the following exceptions: No blanket nor stove is required; the boiling water is to be in a pitcher and the basin empty, but warmed; a binder and safety pins will be needed.

[1] This is generally used in a hospital but a piece of doubled flannel or a cotton pad can be used.

[2] A stupe wringer is a towel of heavy material, such as crash or ticking, with a fold at each end through which sticks can be run. The sticks make it easier to wring the stupes, but they are not necessary.

[3] In the author's opinion the use of a rubber under the patient is not advisable, for, if the flannel is left moist enough to wet the bed, there will be risk of burning the patient, and the absence of the rubber serves as a reminder to wring the flannel very dry.

Requisites for turpentine stupes.—Same as for either Method 1 or 2 plus.—1. Turpentine and oil in a glass (for proportions see page 498).

2. A swab made by tying a pledget of absorbent cotton on one end of a glass rod.

Requisites for fomentations for the eyes.—1. Compresses of absorbent cotton about one and a half inches square, the number depending upon conditions, for, if there is suppuration, the same compress must not be used twice; otherwise, five or six will probably be enough.

2. A towel.

3. A bath thermometer.

4. A pitcher of boiling and one of cold water or whatever solution is prescribed.

5. A dressing basin.

6. A bag or other receptacle for used compresses.

7. If the treatment is to be continued for any length of time, a pail or jar and a stove.

8. If the treatment is for a communicable infection or following operation, gloves. These must be sterile for the latter condition.

These articles should all be arranged in convenient order on a tray.

Abdominal Stupes

Procedure for Method 1.—Arrange the stove, light the gas, put on the basin of boiling water.

Double one of the pieces of flannel. Place it in the center of the towel or wringer and put as much of this as envelops the flannel in the boiling water, but leave the ends hanging over the side of the basin.

Put the blanket over the patient's chest and abdomen and turn down the bed covers to the groin. If

the use of a rectal tube has been prescribed,[1] insert it and put its free end in a kidney-basin or small bowl as feces may be expelled with the gas.

Turn the nightgown up above the abdomen. Cover the abdomen with the oil muslin and the latter with dry flannel.

Wring the water out of the flannel by twisting the two ends of the towels (or the sticks) in opposite directions. Do this until it is impossible to wring out any more water.

Remove the flannel from the towel; give it a quick shake and pass it (doubled) under the protector (be sure that it is not too hot); spread it out over the abdomen.

Place the other piece of flannel in the towel and this in the boiling water and, after three minutes have elapsed, use this flannel to replace that on the abdomen.

The stupes are to be changed without removing the protector or blanket, but you must raise these slightly each time you make a change to ascertain the color of the skin.

Continue the treatment the length of time prescribed; this is usually twenty minutes.

Dry the abdomen; cover it with the dry fold of flannel or a quilted pad.

Method 2.—Prepare the patient as for Method 1, but it is not usually considered necessary to replace the bed covers with a blanket on the upper part of the body, as usually the covers can be moved from over the abdomen sufficiently without uncovering any other part of the body.

Pass a binder under the patient in position to be pinned around the abdomen.

[1] This prescription is common when the stupes are used to relieve tympanites as it often aids in the expulsion of gas.

Put one piece of flannel in the towel or wringer and this, except the two ends, in the basin. Pour the boiling water over the part containing the flannel.

Wring the stupe and apply it as in Method 1. Bring up the sides of the binder and pin it.

Change the stupe in ten or fifteen minutes (as prescribed). The treatment is usually continued from one to two hours.

When stupes are used after an abdominal operation the binder is removed and the dressing covered with a piece of oil muslin secured in place with adhesive plaster.

Turpentine Stupes

Turpentine stupes are given in the same manner a the simple hot water stupes plus the use of turpentine which increases the counterirritant effect.

Sometimes the turpentine is sprinkled on the wet flannel just before applying the latter, but the safest way to use turpentine for this purpose is to mix it with oil in a small glass (using, for an adult, one part turpentine to two of oil, and one to six, or one to ten, for children) and rub this mixture over the abdomen before applying the stupe. When Method 2 is used an application is usually made before each stupe is applied, but with Method 1, it is generally only made three or four times during a treatment; the number depending upon how red the skin becomes. As the oil and turpentine soon separate the mixture must be stirred before each application; this can be done with the free end of the glass rod.

Stupes for the Breasts

Fomentations for the breasts are occasionally prescribed. They can be applied in the same manner as abdominal stupes, but holes should be cut in the stupe

flannels for the nipples as these must not be covered with the hot flannel.

Eye Fomentations

Fomentations for the eyes are used in some inflammatory conditions of these organs.

Procedure.—Put a towel around the patient's neck.

Pour some water or solution into the bowel and make it the required temperature; this is generally about 150° F.

Put in some pledgets; squeeze the water from one and put it on the eye. Change this in two minutes for a hot one. If there is any suppuration a fresh pledget must be used for each application. Continue the treatment the required length of time and keep the solution at the prescribed temperature.

If both eyes are to be treated use separate bowls and compresses for each eye and squeeze the compresses for each eye with a different hand.

Demonstration 86

Methods of Using Hot-Water Bags, Electric Pads, Plasters, Ointments, Liniments, Cautery, Flatiron, Ice-Coil, Ice-Caps, Cold Compresses

Requisites.[1]—1. Electric pad.

2. Cantharides and belladonna plasters, oil muslin, adhesive plaster, scissors, oil, cantharidal collodion, swabs, bag or other receptacle for used swabs, etc.

3. Gauze compresses, ointments, spatula.

4. Liniments.

5. Cautery.

[1] The articles required for different procedures are listed together

6. Flatiron, piece of flannel about half a yard square.

7. Ice-cap, ice, appliances for cracking ice.

8. Ice-coil, a large irrigator, and a clamp for the tubing of the coil, or else a funnel and pitcher and pail, ice and water in the irrigator or pail, a stand for the irrigator, an empty pail, small strip of adhesive plaster.

9. Two dressing basins, one enough smaller than the other to be inverted in it, lump of ice, small bowl containing prescribed solution, this is usually boric acid 2–4 per cent., absorbent cotton, bag or other receptacle for used compresses, dressing towel.

Hot-Water Bag

The method of filling and protecting a hot-water bag has been already described. Special points to remember when using a bag for the relief of pain are: (1) That, as a rule, only a small amount of water is to be put in, for a bag used for this purpose is generally needed as light as possible. (2) On no account is a patient's judgment to be relied on for the suitability of the temperature; this must be judged by the color of the skin, since as already stated, when a person is in pain, intense heat, even sufficient to cause blistering, is often a relief.

Electric Pad

An electric pad is sometimes substituted for a hot-water bag. Two points to remember about such pads are that (1) their temperature is likely to increase beyond a safe degree when the current is turned on for a long time; (2) it is necessary to examine old pads before using them to see that their insulating material is intact; bedclothes have been set on fire by defective insulating material.

Liniments

Liniments are liquid or semi-liquid preparations of drugs (chiefly counterirritants) dissolved, as a rule, in alcohol or some oily substance.

To apply liniment place the patient in a comfortable position with the part to be treated exposed; pour a little liniment on the part (do not let the bottle touch the skin while doing so) and rub it over the skin with your hand, using as much pressure as the patient can stand. Continue the treatment for about ten minutes.

Guiacol and glycerine, though not strictly a liniment, may be mentioned here. It is a counterirritant preparation that is considerably used for the relief of pain in arthritic joints. It is painted over the surface with a cotton swab. The application must be very thin, otherwise it will blister. Should too much be used, remove it by washing the part with alcohol or glycerine. After the application dries the part is usually covered with absorbent cotton or wadding and bandaged.

Ointments

Ointments are preparations of drugs in some fatty base as lard, cold cream, or vaseline. The majority of drugs used in this way are either emollient, antiseptic, or astringent; two important exceptions are mercury and belladonna; for the action of these drugs see Materia Medica.

Ointments are used (1) to ameliorate abnormal conditions of the skin; (2) to protect and remedy abraided surfaces; (3) that they may be absorbed and produce either local or systemic effects after absorption.

Ointments used for local effects are usually spread on gauze, soft muslin, or lint and secured to the part being treated with a bandage or binder, or, if the part is exposed, as the face, the ointment is sometimes applied directly to

the part and left uncovered. When the face has to be covered a "mask" is made, *i. e.*, holes are cut in the lint for the eyes, nostrils, and mouth, pieces of tape or bandage are sewn to the lower edges (these are tied around the neck) and a piece is sewn to the center of the upper edge, this is brought over the back of the head and tied to the other pieces.

When used for effects after absorption an ointment is administered by inunction, *i. e.*, it is rubbed into the skin. Very few substances are absorbed through the unbroken skin, fats, and a few drugs when in a fatty medium, are absorbed by way of the sebaceous glands, but the only preparations commonly administered by inunction are mercury, and non-medicated oils and fats.

Mercury is very commonly administered in ointment by inunction in the treatment of syphilis because it is likely to induce gastro-intestinal disturbances if taken by mouth in sufficient quantities to be of use in this disease. **Belladonna** is occasionally administered externally to (1) depress sensory nerve-endings and thus lessen pain, but its anodyne property is very slight; (2) to check the secretion of milk, when used for this purpose it is applied to the breasts, both by inunction and as a local application. When given by inunction, unless massage is also prescribed, very little pressure is to be used and, for a local application, a hole is to be made in each piece of lint for the nipples, as these should not be covered with the drug nor pressed upon. To prevent pressure, if the binder used to retain the application in place is to be fastened firmly, rings of soft cotton should be put over the nipples. **Fatty substances** are used for inunction (usually a real massage) both to improve the condition of tissues in which there is chronic inflammation and especially in poorly nourished infants with digestive disturbances, to afford nutriment

Points to be observed in the use of ointments.—(1) Use a clean spatula or other suitable utensil to take ointment from a jar and, when the ointment is to be used on an abraided surface, it and the utensil should be sterile. (2) Before applying an ointment that is to be absorbed, wash the skin with (a) either ether or alcohol, to remove sebaceous matter which interferes with absorption; (b) hot water, this softens the skin and increases the amount of blood in the part and thus favors absorption. (3) Wear a rubber glove or finger-cot when giving a mercury inunction, otherwise you will absorb some of the drug, possibly enough to cause annoying symptoms, such as salivation, while the patient will not get the full dose. (4) A mercury inunction must not be given at the site of a previous application until four or five days have elapsed, because mercury is irritating to the skin. In order that an application may not be made too soon to a part previously used it is customary to record the area to which each one is made on the patient's chart.

The sites chosen for inunction when the drug is intended to be absorbed by the blood and carried through the body are those parts of the body where the skin is thinnest, such as the inner surfaces of the thighs and elbow joints, the groins, and axillæ, but if the drug is intended to affect a superficial localized area the ointment is applied directly above this point.

Plasters

Plasters are preparations of drugs combined with some resinous substance which is spread upon, and adheres to, muslin or other foundation. The plasters in most common use are mustard, cantharides, and belladonna. The use of mustard has been already discussed; belladonna plaster is used for the same purposes as the ointment; cantharides is used as a vesicant.

The skin is prepared for the application of a plaster in the same manner as for an inunction. The cleansing process must be particularly thorough for a cantharides plaster and should include the use of soap and hot water, also, if there is hair on the part it should be shaved and it is well, after the skin is cleansed and dried, to moisten it with vinegar and apply the plaster while the skin is wet.

To apply either a belladonna or cantharides plaster heat it slightly (this can be done by putting it in a warm oven for a few seconds or under the lighted burner of a gas stove, about three inches from the flame), if the plaster is at all dry oil the medicated surface by brushing it with a swab wet with sterile oil, lay the plaster on the skin, run your hand lightly over the upper surface; a belladonna plaster will then adhere to the skin, but a cantharides usually requires to be fixed in place or in some way protected from being brushed off by the bed covers or clothing. It must not, however, be strapped down tightly. A bandage can be used for the purpose or a *cap* made as follows: Take a piece of oil muslin somewhat larger than the plaster that is to be used, cut a triangular piece out of each side, as shown in Fig. 56, arrange the cut edges of each side together with strips of adhesive plaster (see Fig. 57), have three of the strips about three inches longer than the *cap* cut the corners of the *cap* so as to make it round as in Fig. 57.

Put the *cap* over the plaster and secure it in place with the strips of adhesive plaster. One side is left free so that it can be raised and the skin watched for the appearance of a blister. This usually forms in from four to eight hours, but will do so sooner on some skins and not even in eight hours on others, but a cantharides plaster is never left on longer than eight hours. If a blister does not form before this time, after the plaster is removed,

the application of a poultice is usually prescribed as the heat promotes the separation of the epidermis.

A very important fact to remember regarding cantharides is that it is absorbed through the skin and eliminated through the kidneys and irritates these organs as well as the skin; for this reason, as well as to avoid having a

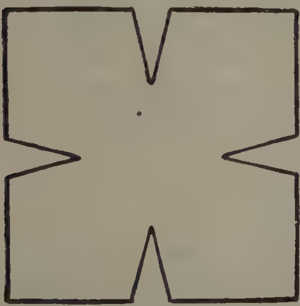

Fig. 56. Oiled muslin cut for cap.

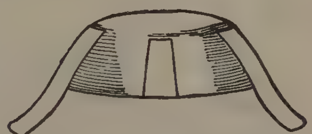

Fig. 57. Cap formed by bringing cut edges together with adhesive plaster and cutting off the corners of the muslin.

larger blister than necessary, always get a definite statement from the doctor regarding the size of the plaster he wishes used; this is generally from one half to two inches and does not exceed three inches.

When removing a cantharides plaster, be careful not to break the skin; remove any adhering particles of cantharides by washing the part gently with oil. Occasionally, though not as a rule, the physician wants the blister punctured. When this is the case, make a slit in its lowest corner with sterile scissors, hold a sterile compress below the incision to catch the escaping fluid, and make slight pressure above the bleb with a sterile sponge to promote the escape of the fluid. Whether the blister

is opened or not it is usually covered with a sterile gauze compress or a cap such as that just described to protect it from dirt and the friction of clothing, etc.

To apply cantharidal collodion wash and disinfect the skin as when using a plaster; outline the space to which the vesicant is to be applied with oil, in order to prevent the latter spreading; paint a thin coating of the collodion over the prescribed area with a sterile cotton swab. After the blister forms, remove the collodion by patting the part gently with a sterile gauze sponge wet with ether. Treat the blister in the same way as that caused by a plaster.

Heated Metal

A flatiron is sometimes used as a source of heat and counterirritation in the treatment of lumbago and similar maladies because the pressure made with the iron helps in alleviating the pain. To use one, dry the skin of the area thoroughly, cover it with a piece of flannel, and pass a heated iron back and forth over the latter for about twenty minutes. Have the iron as hot, and make as much pressure, as the patient can bear. It may be necessary to make light pressure at first and increase it gradually. Raise the flannel from time to time to see that the skin is not becoming too deep a red.

A thermo-cautery or an electric cautery is occasionally used to promote counterirritation. The cautery is generally used by the doctor and the nurse's duties consist in preparing the patient and the cautery. To prepare the patient place her in a comfortable position with the part that is to be treated exposed, dry the skin, and if a blister is to be made, wash and disinfect the area to be treated; do not use either ether or alcohol for the purpose unless the preparation is done some time pre-

vious to the cauterization, for if any remains on the skin it might take fire.

The essential parts of the cauteries used for this purpose are a hollow metal tip and arrangements for heating this. To do this with an electric cautery usually merely requires making connections for the passage of the electric current, but the Pacquelin's thermo-cautery is more complicated. In this appliance the tip screws into a metal tube which serves both as a handle and as a reservoir for a small sponge which, before the cautery is used, is wet with benzene; on the other end of this tube a piece of rubber tubing connected with two bulbs is attached. One of these, known as the air reservoir, is of very soft rubber and is covered with netting to prevent its too free expansion, the other is of thicker rubber. By squeezing the latter occasionally air is pumped through the tubes and forces benzene vapor into the hollow tip and, after the tip is heated by holding it in a flame, this will maintain its temperature. Care must be taken not to pump in too much air or the rubber reservoir may burst; this should never be distended to its full capacity. Care must also be taken not to let the heated tip come in contact with anything, both because it will scorch or burn anything inflammable and because the tip, when heated, is easily dented. When the cautery is used as a counterirritant it is not allowed to touch the skin but is passed back and forth above the part being treated until the latter is well reddened.

Methods of Using Cold Applications

The appliances most frequently used for cold applications to limited areas are ice-caps, ice-coils, and cold compresses.

Ice-Caps

The special points to remember in connection with the use of ice-caps are: 1. To break the ice into pieces about the size of large walnuts; if the pieces are larger than this the cap is not likely to fit over the part well, if smaller they will melt too quickly.

2. Let some hot water run over the ice to blunt the sharp edges which might pierce the rubber.

3. Roll up the sides of the cap before putting in the ice, and, after doing so, squeeze it above the ice, to expel the air.

4. Do not fill a cap more than three quarters its capacity and not even this much when its weight will cause discomfort. Envelop it in a gauze or muslin protector.

5. If the weight of a cap annoys the patient tie the cap to some support such as a bed cradle and place this so that the cap will barely rest upon the part.

The care of ice-caps after use was described in Chapter III.

Ice-Coils

Ice-coils consist of rubber tubing about one-quarter of an inch in diameter held in a coil with narrow bands of rubber[1] and having two loose ends about two yards long for the passage of ice water to and from the coil.

To use a coil, place the stand for the reservoir by the bedside, and if the latter has an outlet at the bottom, before filling it with water and ice, put a clamp on the end

[1] A coil can be improvised in emergency by coiling tubing in the same manner as the bought coils, putting three or four rows of tape on each side of the tubing (to take the place of the rubber bands) and stitching the tapes opposite each other together at the lower edge of each circle of tubing.

of tubing coming from the center of he coil and attach the tubing to the reservoir outlet.

Place the reservoir on the stand; it should not be more than about a foot above the patient, otherwise the water will run through unnecessarily quickly.

Envelop the circular portion of the coil in gauze and place this on the affected part.

Place the empty pail at the side of the bed and put the end of the tubing extending from the outside of the coil into this, and it is well to secure it in place; this can be done with a small piece of adhesive plaster.

Open the clamp and let the water run slowly through the coil.

If the reservoir has no outlet at the bottom it will be necessary to get the water through the tubing by siphonage. To do this: Put a funnel in the end of the tubing coming from the center o the coil, hold this and the end of the tubing extending from he outer part of the coil in the left hand, pour water from the pitcher into the funnel until it and the tubing of the coil are filled, then compress the tip of the free end of the tubing against the funnel, put down the pitcher, take the free end of the tubing in your freed hand and, simultaneously, lower this into the empty pail and the funnel into the reservoir. Do not allow the water to run from the tubing or the funnel until the latter is inverted in the water.

The rest of the procedure is the same as when a reservoir with a lower outlet is used.

Cold Compresses

The only cold compresses that need be described here are those for the eyes. These are usually of absorbent cotton cut a little larger than the eye.

Place the compresses and small bowl of solution on a

tray covered with a towel. Put a bag or other utensil in a convenient place to receive used compresses. Invert a small bowl or deep saucer in a larger bowl and place a lump of ice on this.[1] Wet some compresses in the solution and place them on the ice. Use these compresses in the same manner, observing the same precautions, as the eye fomentations.

Demonstration 87

Cupping. Application of Bandage to Induce Hyperemia

Requisites.—1. A tray containing the articles required when the vacuum is created by heat, viz.; (a) Cupping glasses,[2] the number depending upon the purpose for which they are used; if a considerable area is to be covered, as when the treatment is for relief of congestion of the lungs or kidneys, six or eight will be needed; (b) an alcohol lamp, a glass[3] containing about half an ounce of alcohol; (c) a metal rod with a swab of absorbent cotton on one end, and absorbent cotton with which to make fresh swabs; (d) a receptacle for used swabs; (e) a glass containing water with which to extinguish swabs before changing them; (f) matches; (g) a towel; (h) a gauze compress.

2. (a) Bier's cups; (b) vaseline or oil; (c) swabs for applying the latter; (d) a receptacle for used swabs; (e)

[1] The ice is thus kept above the water which collects as the ice melts and it will not melt as quickly as it otherwise would.

[2] In the hospital special thick-rimmed glasses are provided, but any small smooth-edged thick glasses will answer; thin glasses are not suitable as they might be broken and cut the patient during their application.

[3] This glass must not be the same as the cupping glasses for, if it were, the ignited rod might be put into it by mistake.

soap; (f) a gauze or muslin bandage. When a cup is used over a wound, it, the oil and swabs must be sterile.

3. A rubber bandage.

Cupping consists in the application of glass[1] cups in which a vacuum has been created. As the result of the vacuum the tissue under the cups is forced into them. This results in hyperemia of this tissue and the treatment is given both to obtain the local effects of hyperemia and for the relief of congestion in underlying structures as described under counterirritation.

The vacuum may be created in the cups by the use of heat or with a pump or rubber bulb. Heat creates a vacuum because it causes the expansion and consequent expulsion of air from a cup; a pump will create a vacuum because, when its piston is pressed down, the air in its cylinder is forced out and, when its piston is drawn back, after the cup is in position, the air in the latter is forced into the emptied cylinder. The bulb acts in practically the same manner as the pump, the air being expelled from it when it is squeezed, and, when it relaxes, after the cup is in position, the air from the latter passes into the bulb.

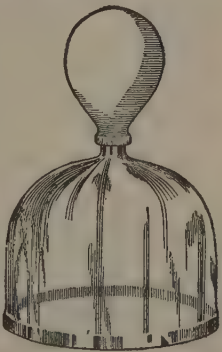

Fig. 58. Bier's cup.

Cups provided with pumps and bulbs are known as *Bier's cups* after the inventor who demonstrated their use to induce hyperemia in the treatment of external inflammations. Bier's cups vary greatly in size, the smallest ones (for use over carbuncles and the like) being only about an inch in diameter, and the largest ones of sufficient size to enclose an arm and forearm or a foot.

[1] The cups are of glass so that the color of the skin can be watched.

When the inflamed area is external, as a rule, only one cup is used and this must be large enough to extend slightly beyond the inflamed area; when the cupping is performed to relieve internal congestion, a number of cups are generally used, these may be either Bier's or those in which a vacuum is created with heat.

A method of cupping when the vacuum is created by heat. Important points to remember are:

1. If the patient is conscious tell her something of what you are going to do, otherwise she may be frightened.

2. Do not let the rims of the glasses become heated. To avoid this have a small flame and do not let it come in contact with the rims. The size of the flame depends upon the size of the swab; this should not be longer than between an inch and an inch and a half.

3. Do not have enough alcohol on the swab for it to drip or it may do so while burning.

4. Do not use a swab after it becomes charred for burning pieces may then drop from it.

5. Watch the color of the skin while cupping and remove a glass if ecchymosis is likely to be caused.

Procedure.—Arrange the apparatus. Leave the glasses with the alcohol and water, the receptacle for used swabs, and the lamp on the tray. Place the lamp and glass of alcohol in such relative position that the lighted swab will not be passed over the glass of alcohol. Put the towel across one end of the table, or if the tray is a large one, across one end of it, but do not let it come near the lamp or the alcohol. Place the glasses on this.[1] Unless the swab has been prepared, make one by winding a thin

[1] This arrangement is to prevent nicking the rims of the glasses which occasionally happens when they are put down quickly on a hard surface.

layer of absorbent cotton around one end of the metal rod. Make sure that it is firmly in place.

Draw the patient to the side of the bed, if necessary and her condition permits; make her as comfortable as possible, and expose the part to be treated. If there is hair on the part, remove by clipping or shaving as it may take fire.

Dip the swab in alcohol, ignite it in the flame, swab the sides of a glass with it, avoiding the rim, then, quickly place the glass on part of the area to be cupped. Repeat the procedure, using other glasses, until the prescribed area is covered.

Put out the light by dipping the swab in water. Remove the glasses; to do this, insert a finger under the rim of each glass so as to let in some air; if the glasses in which there is much tissue are pulled off without doing this pain will be caused.

Wipe the glasses with the gauze compress and repeat the procedure.

Do this for the length of time prescribed, which is generally about ten to fifteen minutes.

Wash the glasses with soap and water before putting them away.

Another method of creating a vacuum with heat, which does away with the use of alcohol, is to moisten one side of small pledgets of absorbent cotton with water and stick one in each cupping glass and ignite the cotton with a lighted match just before a cup is required.

To apply a Bier's cup on a flat surface.—If the inflammation is at the exterior of the body, choose a cup that is large enough to extend about an inch beyond the inflamed area; oil the edges of the cup with vaseline.[1] Place it in position and, at the same time, squeeze the

[1] This is to make the cup adhere firmly to the skin and thus prevent the entrance of air.

bulb. As the bulb resumes its shape, if the cup has been properly applied, the tissue will rise in the glass.

To use a Bier's cup on an inflamed limb.—Lubricate the skin with soap where the cuff, with which the cups for this purpose are provided, will rest; this must be slightly beyond the inflamed area.

Put the limb, to about an inch above the inflamed portion, in the cup and secure the cuff snugly with a bandage. Exhaust the air with the pump. Do not do this too quickly nor too thoroughly or pain will be caused. Watch the color of the skin and cease pumping if it begins to assume a mottled appearance, or if the patient complains of pain.

If there is a wound, the cup should be sterilized, and if the wound is covered with a dressing, this should be loosened or removed, for the congestion promoted by the treatment induces swelling of the part, and if there is pus in the wound, it will be more likely to be evacuated if the wound is uncovered.

Wet Cupping

So-called wet cupping is rarely performed at the present time. It consists in making one or more superficial incisions with a scarifier or scalpel before applying a cup and leaving the latter in place until the amount of blood that it is desired to remove has been withdrawn. After the cup is removed the incisions are washed with a disinfectant and a sterile dressing is applied.

The treatment is performed by a doctor and the nurse's duties consist in preparing the patient and utensils. The area to be treated is cleansed and disinfected as when an incision is to be for other purposes. The cup and knife must be sterile and the same precautions against infection are to be taken as when dressing a wound.

Use of Bandage to Induce Hyperemia

Choose a rubber bandage long enough to make two or three circular turns around the part to which it is to be applied and about, for a finger, half an inch wide, and for an arm or leg, between two and three inches wide. Apply the bandage between the inflamed part and the heart, a considerable distance above the former; thus if this is a hand, put the bandage above the elbow; if a leg, above the knee. Apply it tightly enough to cause the veins below it to become prominent and the skin a deep red color, but not so tightly that the beat of the artery cannot be felt. Feel the radial artery if the bandage is on the arm and the dorsalis pedis if it is on the leg.

CHAPTER XVII

Treatments Used to Supply the Body with Fluid Intravenous Injections. Administration of Salvarsan, Etc.

Types of treatment used to supply the body with fluid. Conditions which cause a deficiency of liquid in the body. The more important uses of infusions. Protoclysis. Enteroclysis. Hypodermoclysis. Intravenous infusion. Transfusion. Intravenous injections. Administration of salvarsan and neo-salvarsan. Uses of these drugs.

The treatments used to supply the body with liquid when a sufficient amount cannot be taken by mouth are: (1) Those classed as infusions, viz., protoclysis, enteroclysis, hypodermoclysis, and intravenous infusion, and (2) transfusion.

Conditions which make such treatments necessary are: 1. Deficiency of fluid in the body. This may be due to either excessive loss of fluid from the body or to lessened intake of liquid. **The most common causes of excessive loss are:** Loss of blood such as occurs during surgical operations and hemorrhage, continued vomiting and diarrhea, excessive diaphoresis.

2. The presence of toxic substances in the body, either (a) those formed in the body by bacteria, or as the result of defective elimination, or defective metabolism; (b) ingested poisons. The need for extra fluid in such case is twofold, (a) to stimulate the activity of the kid-

neys and thus promote the excretion of the poisons, (b) to dilute the poisons during their excretion and thus minimize their irritant action on the kidneys.

3. Collapse and shock, in these conditions the blood tends to accumulate in the small vessels, which are abnormally relaxed, so that the amount of circulating blood is diminished; this greatly interferes with the heart's action and, by thus lessening the amount of water, oxygen, etc. taken to the tissues produces symptoms similar to those associated with hemorrhage. The introduction of liquid into the blood-vessels under such circumstances tends to increase blood pressure and, thereby, to force the heart to take stronger contractions and to act more slowly.

The conditions which most commonly inhibit the intake of an adequate amount of water by mouth are (1) those following surgical operations, especially operations on the abdominal organs; (2) inflammatory and ulcerative conditions of the stomach and intestines; (3) peritonitis; and (4) continued nausea and vomiting from any cause.

Demonstration 88

Protoclysis, Rectoclysis, or Murphy Drip[1]

Purposes.—To supply the body with water and, in some cases, nourishment, in the form of glucose, and an alkali to overcome acidosis.

This treatment consists in the slow introduction of fluid into the intestine in amounts that can be readily absorbed and **the aim of the technique** is to guard against all irritation of the bowel, for irritation will at once pro-

[1] So-called after Dr. John P. Murphy one of the first men to advocate this method of giving water for the purposes mentioned above.

mote intestinal contraction and the consequent expulsion of the fluid.

In order for the treatment to be successful, the technique must be perfect, and failure is almost always the result of either ignorance or carelessness on the part of the one giving the treatment.

To avoid irritating the intestine it is necessary; (1) To use a non-irritant solution; (2) to have the fluid about the same temperature as the body when it enters the rectum; (3) to prevent distention of the bowel by (a) providing means for the escape of gas, unabsorbed water, etc., from the intestine, (b) to regulate the height of the reservoir containing the liquid for the treatment, so that the latter, on entering the intestine, will not induce a pressure exceeding a four-inch hydraulic pressure[1] or, when abdominal inflammation exists a five- to six-inch pressure. The reason for increasing the pressure when there is abdominal inflammation is that the inflammation increases the intra-abdominal pressure and to get the best results from the treatment the pressure of the contents of the bowel (including the water) and the tension upon the walls of the intestine are to be about equal. It can be easily appreciated that if gas or water is allowed to collect, or if there is feces in the lower part of the bowel, the intra-intestinal pressure will be increased and the bowel become distended. Therefore, as previously stated free passage for gas and unabsorbed water from the bowel

[1] The term *hydraulic* refers to fluids in motion and thus hydraulic pressure means the pressure exerted by fluid in motion. When the flow is controlled by gravity, the degree of pressure that it will exert is determined by the difference in the height of the outlet of the reservoir and the level to which the fluid flows, which, in this case, is the rectum. Thus for a four-inch hydraulic pressure, the outlet of the reservoir is to be placed four inches above the rectum, for a five-inch pressure, five inches above the rectum.

to the reservoir must be provided, and if there is any amount of feces present the doctor should be notified, unless there is a standing order to give an enema or rectal irrigation under such circumstances. When either of these are given, the protoclysis is usually discontinued for a short time until the peristaltic action induced by such treatments ceases.

There are two methods of regulating the flow of solution in common use.—(1) By the height of the reservoir, this is very generally known as the *gravity method* and as the *Murphy method* (it was the one first described by Dr. Murphy); (2) by the use of some form of apparatus that will regulate the flow so that the solution will enter the rectum drop by drop, three drops per second being the usual rate, this is generally referred to as the *drop method.*

Some nurses find the drop method easier to regulate, but it has the disadvantage of requiring apparatus that is not always easy to obtain and thus the pupils should have experience in using the Murphy method, even though it is not the one in general use in their hospital.

Murphy Method

Requisites. 1. A reservoir (*when possible, this should be a graduated glass irrigator*) connected with rubber tubing of sufficient length to reach without tension to the patient's rectum. There should be a stop-cock on the tubing to control the flow until the treatment is started, but during the treatment it must not restrict the caliber of the tube in the least, for the flow is to be controlled by gravity alone, and never by constriction on the tube, so that when the patient endeavors to expel gas, etc., any

unabsorbed fluid will at once pass back to the reservoir, otherwise distress will be caused and the fluid is likely to be expelled in the bed.

2. The solution—this is put in the reservoir. Solutions commonly prescribed are: Half strength normal sodium chlorid solution; 5% sodium bicarbonate solution; 5% glucose solution; equal parts of sodium bicarbonate and glucose (*sodium bicarbonate is used to increase the alkalescence of the blood when there is a tendency to acidosis, as is common when metabolism is interfered with; glucose is used for its fuel value when a patient is unable to take sufficient nourishment by mouth.* The temperature generally prescribed for the solution is 105° F.

3. A stand for the reservoir.

4. A protoclysis nozzle (see Fig. 59), or a small rectal tube, or a large catheter (number Fr. 18, E. 10, Am. 12), some physicians do not approve of the use of a catheter for this method of protoclysis because, as the lumen of the catheter is smaller than that of a rectal tube, it does not allow as free passage of the unabsorbed water from the intestine.

5. A lubricant and a square of paper or gauze sponge to apply it.

6. A heater.[1]

[1] There are a number of patented appliances to be had for this purpose and, also there are several different devices used as substitutes. One of the best of these is a hot-water bag with a thick flannelette cover that has a hole just the size of the rubber tubing in its lower end. The tubing is put in under the cover through the ordinary opening of the latter and is brought out through the hole in the bottom, thus it lies stretched across the length of, and directly in contact with, the hot-water bag. The hot-water bag is placed at the extreme edge of the side of the bed and is kept in place by tying the string which keeps the cover closed around the bar at the side of the bed. It is very important to secure the bag in place, because it

7. A thermometer.
8. Adhesive plaster.
9. A basin or pitcher.
10. A towel.
11. A small soft pad.
12. A tape measure or ruler.

Procedure. Put the pad in place to catch any possible leakage from the rectum. The treatment can be given with the patient in any position.

Arrange the apparatus and *remember that the outlet of the reservoir is not to be more than four inches higher than the patient's rectum*, if the patient has peritonitis, the reservoir is to be raised an inch or two as required after a short time. (*It is so important for the height of the reservoir to be right that the pupils should measure the height with a rule or other measure until they have given the treatment often enough to make an absolutely accurate judgment without doing so*).

Put the thermometer in the solution, see that the temperature is right, cover the top of the reservoir with a folded towel.

Expel the air from, and warm, the tubing by letting solution run from it into the basin or pitcher provided for the purpose. Constrict the tubing to shut off the flow.

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must be kept as hot as possible and thus might burn the patient if it came in contact with her. A rather questionable, though frequently used, means of keeping the water hot is to suspend an electric light bulb in the top of the can. The objection to this is that if even a very small amount of water gets into the socket, the water, being a non-conductor of electricity, will oppose the current and thus generate so much heat and force that accidents may occur. Students who have not studied Physics should read the sections in a text-book of Physics dealing with the nature of electric lights and heating appliances.

Lubricate three inches of the nozzle and insert about four inches in the rectum. Some types of nozzle have a rubber plug which retains them in place, if there is no such contrivance, take a strip of adhesive, about half an inch in width and 10 inches long, put the central portion around the tube or nozzle near its exit from the rectum and secure the ends to the sides of the thighs in such fashion that it will hold the nozzle in position.

Do not start the flow for a few seconds, until the patient becomes accustomed to the presence of the nozzle. Then open the stop-cock and do not close it again until the end of the treatment. Do not leave the patient for one moment until you are sure that everything is right. If this is the case, there will be no leakage around the rectum, and after a few minutes have passed there will be no discomfort.

About a pint of liquid will be absorbed within an hour or an hour and a half. A common prescription is that this amount should be given every two hours. The nozzle is not, as a rule, removed between treatments, except when an interval of two hours or more is to elapse between them, as its constant removal and insertion produces irritation of the rectum, when the nozzle is not removed the clamp on the tubing is closed. The periodical discontinuance of the flow for short intervals is to allow of the reabsorption of fluid which transudes from the vessels after a considerable amount of liquid has been absorbed. Before recommencing the treatment it is well to lower the reservoir for a time as this will encourage the evacuation of any unabsorbed fluid. If liquid is expelled empty the reservoir before filling it with the fresh solution.

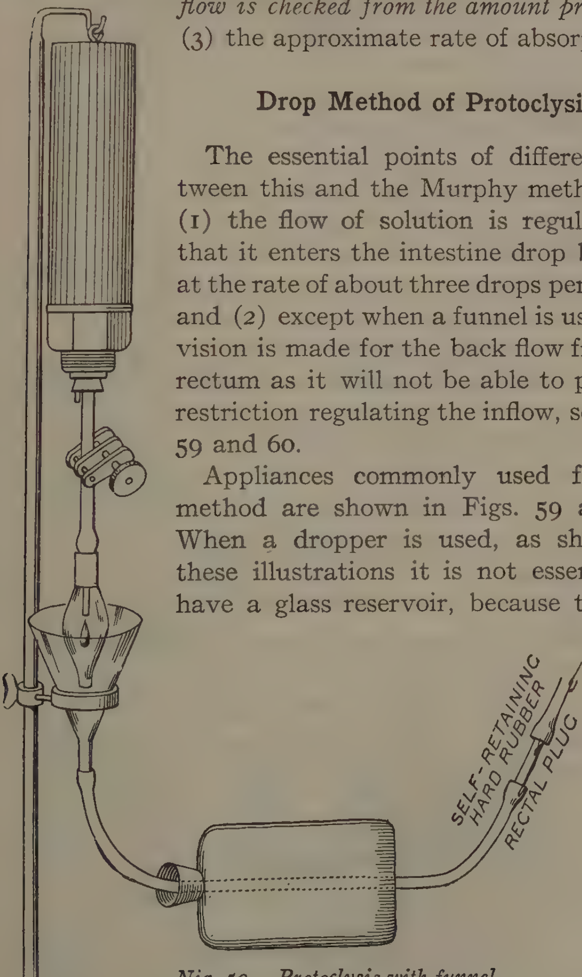
Notice and record (1) if gas is, or is not, expelled during the treatment; (2) how much fluid is absorbed (*this is*

determined by subtracting the amount remaining after the flow is checked from the amount prepared); (3) the approximate rate of absorption.

Drop Method of Protoclysis

The essential points of difference between this and the Murphy method are: (1) the flow of solution is regulated so that it enters the intestine drop by drop at the rate of about three drops per second and (2) except when a funnel is used provision is made for the back flow from the rectum as it will not be able to pass the restriction regulating the inflow, see Figs. 59 and 60.

Appliances commonly used for this method are shown in Figs. 59 and 60. When a dropper is used, as shown in these illustrations it is not essential to have a glass reservoir, because the rate



Nig. 59. Protoclysis with funnel.

of the flow is judged by the drops, and, when a funnel

is used, a very good substitute is a thermos bottle that is provided with a one-hole rubber stopper in which a glass connecting tube is inserted for attachment to the rubber tubing. The bottle is suspended upside down as shown in Fig. 59. When the apparatus is arranged as in Fig. 59 a very essential point is to place the dropper directly above the stem of the funnel.

After letting solution run through the tubing, to warm it and expel the air, regulate the drops to the required rate (usually three drops per second) before putting the nozzle in the rectum. Otherwise, the technique is practically the same as that of the Murphy method.

When the drop method is used a treatment is generally continued for 2 or 3 hours, stopped for an equal length of time, and resumed, and so on.

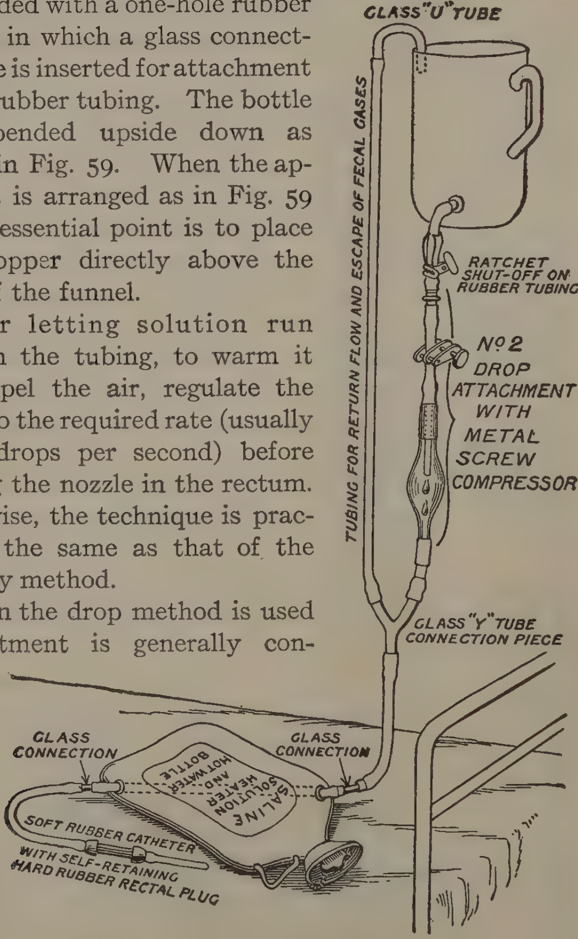


Fig. 60. Meinecke protoclysis outfit.

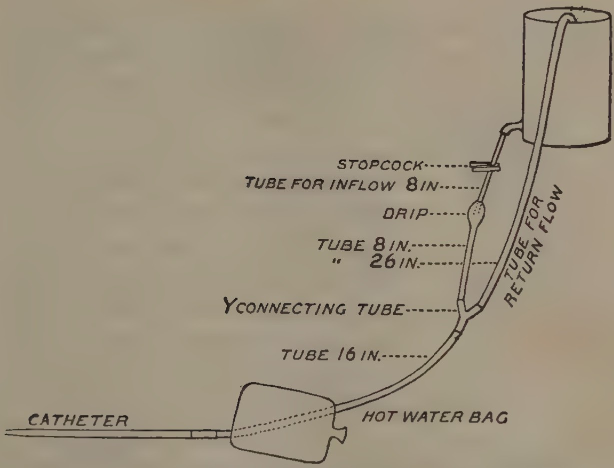


Fig. 61. Improvised substitute for Meinecke outfit.

Demonstration 89

Hypodermoclysis

Hypodermoclysis, or infusion into the subcutaneous tissues, is used chiefly as a substitute for protoclysis when, for any reason, it is not advisable to inject fluid into the rectum.

Equipment.—1. A reservoir for the solution, unless, as is done in some hospitals, the solution is siphoned from the flask in which it is sterilized, in which case a syringe to start siphonage[1] and a U-shaped piece of

[1] This is done by, after putting one end of the long rubber tubing in the solution and fixing it in position with the tube carrier (its end must be almost in contact with the bottom of the flask), inserting the point of the syringe in the other end and drawing out the piston until liquid appears in the syringe. The latter is then withdrawn and the connecting tube to which the other piece or pieces of tubing with

metal rounded like a piece of tubing cut in half lengthwise, and known as a *tube-carrier*, will be needed to keep the tubing from being bent on the rim of the flask. See Fig. 62.

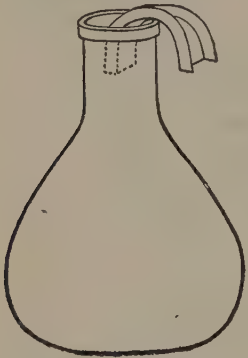


Fig. 62. Curved tube-carrier over rim of flask.

2. A piece of one quarter of an inch diameter tubing about four feet in length and a piece or, if two needles are used, two pieces of tubing of the same diameter about twelve inches long.

3. A glass connecting tube, this, if two needles are used must be either T- or Y-shaped. The object in using a connecting tube when only one needle is employed is that air bubbles will be seen in it should the solution get too low in the irrigator.

4. One or two needles.

5. A thermometer.

6. Two or three, if an irrigator is used, sterile towels in addition to those used for the trays.

7. Eight sterile sponges.

8. Four sterile swabs for applying the iodine and collodion.

9. A hypodermic syringe containing local anesthetic, either cocaine 2% or novocaine is generally used.

10. Two flasks of solution, this is usually either normal salt solution or Lock's solution (*see* footnote on page 530). The solution in one flask should be about five degrees

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the needle attached are inserted and the liquid allowed to run through. Pressure is then made on the tubing to stop the flow until the needles are inserted.

hotter than the temperature required (this is usually 110° F.) to allow for cooling, and that in the other about 140° F.).

11. The detergent and disinfectant for the skin. (Ether and diluted iodine solution (3%) are commonly used) and dressing glasses in which to pour these.

12. Ethereal collodion.

13. Adhesive plaster

14. A kidney basin.

15. A bag for used sponges and swabs.

16. An irrigator stand.

Articles 1 to 10 inclusive are to be sterile.

Procedure.—Arrange the equipment: Place the irrigator stand on one side of the bed.

Scrub two trays or tables and dry them with a sterile towel.

Place articles 1 to 8 inclusive on one of these, and 9 to 15 on the other.

If articles 1 to 7 are kept sterile ready for use, as is a common practice, remove the band keeping the bundle closed and the outer wrapper, but do not open the bundle until you have cleansed your hands. If these things are not kept sterile, sterilize them according to the directions given in Chapter X., and, before touching them scrub and disinfect your hands, cover the tray or table with a sterile towel, put the disinfected articles on this and cover them with a sterile towel.

Feel the patient's pulse so that you will be able to tell if it is improved by the treatment.

Arrange the patient in a comfortable position and adjust the nightgown.

Cleanse and disinfect your hands.

Cleanse and disinfect the patient's skin at the point or points selected for the puncture. This may be any

fleshy part of the body, but in women it is usually the loose tissue at the base of the breasts that is chosen and in men the loose tissue of the flanks, or that just below the axilla, or at the base of the scapulæ.

Scrub your hands with the disinfectant.

Open the bundle of sterile articles, do not touch the outside of the bundle.

Place the sterile towels so that they surround and are in close contact with the area of injection.

Connect the apparatus (*do not touch the needles except at their sockets*) and prepare the solution, leave the thermometer in the latter. (Observe the thermometer from time to time during the treatment and, if necessary, add hot solution. When you do so remember the amount added.)

Place a sterile towel over the top of the reservoir or, if a flask is used, stopper it loosely with a sterile sponge. Place the reservoir on the stand.

Expel air from and warm the tube by letting solution run through.

A doctor usually injects the anesthetic and inserts the needles, but the treatment is sometimes given by senior and graduate nurses for, though it is very important to carry out the technique most carefully, to do so does not require knowledge that cannot be gained by frequently seeing the treatment given.

The precautions required are: (1) Asepsis; (2) the proper insertion of the needles (this must be seen to be understood); and (3) the regulation of the infusion to keep pace with the rate of absorption. This is exceedingly important, for, if the fluid accumulates, its pressure upon nerve-endings will cause pain and, by compressing blood-vessels, it may so interfere with the circulation in the part that a slough will follow. Thus, the tissue should

not be allowed to become distended and, to help avoid this, massage the site of injection and surrounding area making pressure away from the points where the solution is entering. The object of using two needles is to obviate the necessity of introducing a large amount of solution in one place.

As a rule from one to two pints of liquid are given at a time.

When the required amount has been injected, withdraw the needles. Place a sterile sponge over each puncture and gently massage the surrounding parts until fluid ceases to ooze from the holes. Then, seal these with collodion and, when this has dried, cover the punctures with sterile sponges and strap these in place with narrow strips of adhesive plaster.

On the chart record the name of the person who inserted the needles, the amount of fluid given, and the effect of the treatment on the patient.

Demonstration 90

Intravenous Infusion

By intravenous infusion is meant the introduction of fluid into a vein. This method of infusion is used chiefly when, as in shock and hemorrhage, an immediate result is required. The chief effects sought at such times are: (1) a rise of blood pressure and, to further this, either adrenaline or pituitrin[1] is added to the solution; (2) to prevent injury to the tissue cells from loss of fluid; and

[1] Why will these drugs further a rise of blood pressure? Why is pituitrin used instead of adrenaline when there is any tendency to edema of the lungs? If unable to answer these questions see under adrenaline in textbooks of Materia Medica.

(3) following hemorrhage to keep the remaining red corpuscles in circulation so that a fatal loss of oxygen[1] will be prevented until new corpuscles are formed.[2]

The solutions most commonly used for intravenous infusion are: normal saline,[3] Lock's solution,[4] Ringer-Lock solution,[5] Dawson's solution,[6] gum-glucose solution.[7] Also, some drugs, as salvarsan, and certain sera are given intravenously.

Three requirements for substances injected into a vein are: (1) They must be sterile; (2) they must be isotonic[8] with the blood as, otherwise, they will cause hemolysis,[8] and free from any substance that will do this for any other reason; (3) they must not, unless conditions call for interference, affect the coagulable[9] property of the blood.

Equipment.—1. A reservoir or, if the liquid is siphoned from the flask, the substitutes mentioned in the equipment for hypodermoclysis.

2. A piece of tubing about three feet in length, which is attached to the reservoir, and a piece about twelve inches long. There should be a stop-cock on the long piece.

[1] Why will loss of red corpuscles entail loss of oxygen?

[2] When and where are red corpuscles formed? If unable to answer see textbook of Physiology.

[3] 0.9% sodium chlorid solution.

[4] Sodium chlorid 0.9 gm.; potassium chlorid, 0.042 gm.; calcium chlorid, 0.0024 gm.; sodium bicarbonate, 0.03 gm.; dextrose 0.1 gm.; and sufficient distilled water to make 100 c.c.

[5] The same as Lock's solution minus the dextrose.

[6] 0.8% of sodium chlorid and 0.5% of sodium bicarbonate.

[7] A solution of gum acacia and glucose.

[8] If not understood, see Glossary.

[9] Describe the process that is supposed to occur when blood clots. If unable to do so see textbook of Physiology.

3. A straight glass connecting tube, which is used to unite the two pieces of rubber tubing. This is employed in order that should air enter the tubing, air bubbles may be seen, in time to shut off the current and so prevent the air entering the vein.

4. A canula and an infusion needle.

5. A *sharp* scalpel.

6. A pair of *sharp* scissors.

7. Two hemostats.

8. A pair of dissecting forceps.

9. A thermometer.

10. An aneurysm needle, threaded with heavy silk.

11. Two surgeon's needles threaded with suture silk.

12. Twelve gauze sponges.

13. A small sterile dressing.

14. A gauze bandage.

15. Five sterile towels other than those used to cover the tray and apparatus.

16. A tourniquet. A piece of rubber tubing or muslin bandage can be substituted.

17. A hypodermic syringe containing the local anesthetic. Cocaine or novocaine, with or without adrenaline, is commonly used.

18. A sterile basin containing hot (120° F.) normal salt solution.

19. Two sterile aprons and two pairs of sterile gloves. These are left in their wrappings until needed.

20. Catgut in a covered jar.

21. Suture silk in a covered jar or tube.

22. Three flasks of solution. One of these should be a few degrees hotter than the required temperature (which is usually between 116° and 120° F.) to allow for cooling, one should be considerably hotter as it will only be used if necessary to raise the temperature of the former

and one cold, this is to reduce the temperature of the solution if necessary.

23. The preparation tray and, unless iodine is used, a dressing basin containing hot water, a sterile compress and necessary disinfectant. (If iodine is used as a disinfectant either ether or acetone is generally used for cleansing the skin, but, as the color of iodine makes it somewhat difficult to discern the vein, other disinfectants are sometimes substituted for this treatment and then the skin is scrubbed first with green soap or lysol and hot water and then with either ether or alcohol or both, in the order mentioned, and a sterile compress wet with the disinfectant is laid over the arm. If iodine is used it is usually removed when the operator is ready by washing the part with ether.)

24. A dressing rubber.
25. A kidney basin.
26. A bag for soiled sponges.
27. A small basswood splint.
28. An irrigator stand.
29. Two trays.
30. A drop light, except when the light is very good.
31. Disinfectant for the hands.

Articles 1 to 23 inclusive are to be sterile.

This treatment is always given by the doctor, but, in order to give efficient assistance, it is necessary for nurses to know something of its nature, therefore the following brief description is given before the details, of the work expected of the nurses.

Usually, either the median cephalic or the median basilic veins on the anterior surface of the elbow is chosen for the reception of the fluid and, in order to distend them, a tourniquet is put around the upper arm tightly enough to interfere with the venous current. A local anesthetic

is injected under the skin of the area except when the patient is unconscious. An incision is made over the chosen vein and two ligatures are slipped under it with an aneurysm needle, one below and the other above the point where a small incision is to be made in the upper wall of the vein. The lower ligature is tied, the incision made and, after air has been expelled from the tubing, the canula is slipped into the vein, allowed to fill with blood, without permitting any loss, and the tubing is then slipped over its free end, the solution is allowed to flow from the tubing while this is being done. The other ligature is then tied around the canula and vein. As soon as the canula is in the vein, the tourniquet is slowly loosened. The wound is kept moist during the operation with hot saline solution in order to prevent blood clotting. When the required amount of solution has been given the canula is withdrawn, the wound sutured, a dressing applied and, sometimes, especially if the patient is delirious, a short basswood splint is put over the dressing to keep the arm straight.

Sometimes, the infusion needle is used instead of a canula and, in such case, no incision is made, the needle being stabbed through the skin into the vein pointing towards the heart.

Nurses' duties.—There should, if possible, be two nurses to prepare for this treatment and to help the operator, one of whom should act as assistant to the other and do the preliminary stages of the preparation of the patient and the handling of unsterile articles after the other nurse has disinfected her hands and put on sterile gloves and apron.

A good method of procedure is about as follows: The assistant collects the articles required for preparing the patient, except the sterile towels; removes the patient's

arms from the nightgown; puts the rubber under it cleanses and disinfects her own hands thoroughly, as described in Chapter X., and then proceeds with the preparation. The sides and anterior surface of the arm at and for about four inches above and below the elbow are to be prepared. After the area is disinfected the sterile nurse places a sterile towel under the patient's arm, one around the forearm and hand, leaving it rather loose around the latter so that a nurse can slip her hand under it as required, and a third around the upper part of the arm. This, if the tourniquet is sterile, should be smooth and adjusted securely, otherwise, it should be rather loose, as the tourniquet must, if unsterile, be applied underneath it.

In the meantime let the other nurse put the flasks of solution to heat; place the irrigation stand, and, if necessary, the light by the bedside; collect the rest of the apparatus, sterilize the trays in the instrument sterilizer or else wash them with lysol or green soap solution and warm water and dry them with a sterile towel. Arrange articles 1 to 18 inclusive, on one tray and the others, not already disposed of on another, for, while the contents of the jars etc., mentioned after 19 are sterile the outside of the containers are not and thus should not be placed where they may come in contact with instruments and dressings.

As this treatment is used so frequently in emergency it is an almost universal custom in hospitals to have articles 1 to 16 inclusive kept sterile, ready for use, rolled in sterile towels. If this is not done, sterilize them as already directed and cover the tray on which they are to be placed with a sterile towel. The innermost towel surrounding the appliances serves for this purpose when they are kept ready for use.

In such case, when everything has been collected remove the outer wrapping of the bundle, but do not open the latter until you have prepared your hands and put on the apron and gloves.

When you have done so, connect the pieces of the tubing to each other and to the irrigator as previously described.

Prepare the solution and leave the thermometer in it, handle the flasks with a sterile towel. Place a sterile towel over the top of the irrigator or, if a flask is used, stopper it loosely with a sterile sponge. Place the irrigator about two feet above the patient. Put the sterile towels around the patient's arm as previously described, being very careful not to touch anything unsterile, to avoid doing so it is well to have the nurse who prepared the arm raise it as you pass the towels beneath it. Arrange the instruments in the order in which they will be needed. Let the solution run through the tubing until all air is expelled. If air gets into a vein it may be carried to the heart and cause death (*air embolism*). If the operator is not ready cover the apparatus and the patient's arm with sterile towels.

When the operator is ready, apply the tourniquet around the upper part of the arm while the unsterile nurse, putting her hand under the towels, keeps track of the patient's pulse. The tourniquet is to be applied with sufficient pressure to distend the veins in the elbow joint but not tightly enough to stop pulsation in the radial artery. Should the tourniquet not be sterile, take off your gloves while you adjust it and put it under the towel covering the part and, when the time comes for it to be loosened, as you will have resumed your gloves, the *unsterile nurse* will have to attend to it (it will not then be necessary to observe the pulse as when applying

it), and while she is doing so you (the *sterile nurse*) hold the patient's hand, over the sterile towel, to prevent her moving her arm.

During the operation the *sterile nurse* is responsible for the temperature of the solution and is ready to assist the doctor while the assistant, keeping her hand under the towel, over the patient's wrist, restrains the latter's hand and watches her pusle. Also this nurse, as a rule, is responsible for watching the amount of solution used (she stands facing the irrigator) and notifying the doctor when the required amount has been given and before the latter gets low enough in the irrigator to allow the entrance of air into the tubing.

As a rule, in the treatment of shock not associated with hemorrhage, about 500 c.c. are used and, after hemorrhage, about 1000 c.c.

The patient is very likely to have a chill about twenty or thirty minutes after an intravenous infusion, especially when normal saline solution is used. The cause of this is not definitely known. Usually, the chill soon ceases and is not followed by a rise of temperature or other untoward effects, but the patient should not be left alone while it lasts and, if conscious, must be reassured. Keep hot-water bags in the bed until the chill ceases.

Because of the viscosity of **gum-glucose solution** a special apparatus has to be used for its administration. The solution is generally obtained in an ampul and is transferred from this to a special type of buret to which a tube is attached and, at the time of operation, a special form of needle is inserted in the free end of the latter.

Buret, tube, and needle are sterilized in the same manner as the apparatus for the other types of administration and the patient's arm is also prepared as for the other

methods. The solution is heated by placing the ampul in the sterilizer or in boiling water.

The doctor usually transfers the solution to the buret, but a nurse may possibly be expected to do it. The usual procedure is about as follows: Open the ampul by making a scratch in the end with a small file and then break off the end. Flame the opening thus made and then pour the solution into the buret. Two precautions are necessary when making this transfer viz., (1) the solution must be poured in slowly and made to run down the side of the buret, this is to avoid trapping air bubbles in the viscid solution (2) the ampul must not be shaken and the last few c.c. of solution are not to be poured off, this is to avoid decanting the sediment of which there may be a considerable amount in the bottom of the ampul.

After air has been excluded from the tubing attached to the buret by letting solution run through it, the doctor inserts the needle in a vein, allows it to fill with blood, but without permitting loss, and the tube is then rapidly slipped over the free end of the needle.

The assistance required of the nurses is about the same as that needed during the other methods of infusion.

Gum-glucose solution is used more especially in the treatment of shock, in which state it is of particular value because it does not, as the saline solutions do, when there has been no great loss of blood from the body, transude into the tissues, on the contrary, by raising the pressure within the vessels, it furthers the transudation of fluid from the tissues into the blood stream, thus assisting the normal process of restoring the blood-volume. Therefore, gum-glucose solution increases the blood-pressure and, thereby, the energy of the heart action to a greater degree and for a longer time than the salines do. Moreover the glucose provides energy material for the body and,

it is believed, the fluid passing into the vessels from the tissues contains a certain amount of proteins and salts in which case the fluid thus added to the blood must more nearly resemble the composition of the blood plasma than artificial solutions.

Transfusion

The term *transfusion* is, in therapeutics, applied to the transfer of blood from one person (*the donor*) to another (*donee* or *recipient*).

Purposes.—The purposes of transfusion are: (1) To replace blood lost by hemorrhage; (2) to increase blood pressure in shock and collapse by increasing the amount of blood in the vessels; (3) to, in severe anemias, supply the individual with red corpuscles and stimulate the bone marrow in which the corpuscles originate; (4) to supply a patient with a hemorrhagic disease (hemophilia or hemorrhagic purpura) with substances that will check bleeding.

Important advantages that transfusion has over an intravenous infusion in conditions such as shock, collapse, and hemorrhage are: Blood does not transude through the blood-vessels into the tissues as quickly as the saline solutions do and thus will maintain blood pressure for a very much longer time; the blood supplies oxyhemoglobin and thus, after hemorrhage, the body will be at once supplied with its necessary oxygen; and the transfusion may increase the coagulability of the recipient's blood and thus inhibit further hemorrhage; blood supplies leucocytes and other antibacterial substances to the recipient.

The disadvantages of transfusion have been largely overcome by increased laboratory facilities and improved technique. The disadvantages were the danger of: (a)

introducing blood clots into the circulation; (b) causing thrombosis (see page 813); (c) producing hemolysis, *i. e.*, the excessive destruction of red cells; (d) transferring disease, especially syphilis.

Precautions taken to prevent injury to the recipient are.—1. A minute amount of blood is taken from the expectant recipient and a slightly larger amount from the donor and, in the laboratory, (a) the compatibility of the two bloods is tested. To understand this it must be recalled that the blood of some individuals, if mixed with that of others,[1] causes either or both (1) hemolysis (excessive destruction of red corpuscles); (2) agglutination and precipitation of blood cells and, if blood having this effect were used for a patient, thrombosis and embolism (described under Disease of the Blood) would be likely to occur. (b) The donor's blood is subjected to the Wassermann test to see if it contains spirochætæ pallida (*the causation of syphilis*). Also the percentage of corpuscles in the donor's blood is estimated to see if it will be of value to the patient.

2. Measures are taken to prevent the coagulation of the donor's blood that is taken for the recipient. *It will be recalled that* (*a*) *the clotting of blood is initiated by the destruction of thrombocytes or, as they are also called, blood-platelets, presumably because, when they are disintegrated, they set free prothrombin and thromboplastic substances and the latter neutralize or destroy the heparin and antitithrombin which inhibit the clotting of blood and, when these substances are out of the way, the calcium salts of the blood and the thrombin unite to form thrombin which*

[1] The blood of different species of animals are much more incompatible to each other than those of different individuals of the same species and therefore blood from the lower animals cannot, as was at one time suggested, be used for humans.

reacts with the fibrinogen of the blood and forms fibrin which, being insoluble, is precipitated and entangles the blood corpuscles, thus forming a clot. (*b*) *Thrombocytes are readily disintegrated when blood comes in contact with rough surfaces.*

The measures commonly used to prevent clotting are: (1) coating everything with which it will come in contact with a sterile lubricant, such as albolene, (2) mixing with the blood something (sodium citrate) that interacts with the calcium salts and thus prevents the change of prothrombin. *Also the clotting of blood can be prevented by whipping the blood, this causes the immediate precipitation of the fibrin, which clings to the utensil used for the process, and thus it can be all removed. Blood thus treated is known as laked blood. This method, however, is not used for the preparation of blood for transfusion.*

The three methods used for blood transfusion are.—(1) The Unger or direct method, (2) the Lindeman method, (3) the Lewisohn or sodium citrate method.

The first method is now rarely used because (1) it does not permit easy estimation of the amount of blood transferred, (2) it subjects both donor and recipient to more discomfort than the other methods.

Nature of operations.—An arm of both the donor and recipient is prepared in the same manner as for an intravenous infusion. For the first method, the tables on which the two subjects are placed are so arranged that the two arms to be operated upon are in close proximity; the cuff of a sphygmomanometer is strapped around the donor's arm so that the fall of blood pressure occasioned by the loss of blood can be observed and the flow checked before this becomes serious. A canula attached by tubing to a second one is inserted in one of the arteries in the donor's arm and the other canula is introduced into a

vein in the recipient's arm in the same manner as for an intravenous infusion.

In the Lindeman method a number of syringes with a capacity of 20 c.c., each attached to a Lindeman canula, are used. These are sterilized in the usual manner and, after sterilization they are lubricated by alternately, as a rule, three or four times, filling them and expelling sterile albolene. The usual manner of operation is about as follows. Both donor and recipient are made comfortable in the recumbent position, an arm of each is prepared as for an intravenous infusion. Blood is withdrawn from one of the donor's vessels into a syringe and at once injected into one of the recipient's veins. The usual custom is for one doctor to withdraw the blood, hand the syringe to another doctor for injection while the former fills a second syringe and so on. After injecting the blood the operator hands the empty syringe to the nurse assisting and she washes it with sterile salt solution and either hands it to the first operator or else places it on a sterile tray ready for use if needed again. This process is repeated until the amount of blood needed by the patient has been transferred unless, in the mean time, the donor shows signs that he is being adversely affected by the loss of blood.

For the third method blood is taken from one of the donor's veins, as described under phlebotomy and received into a sterile graduated flask containing a warm (about 98 ° F.) sodium citrate solution, usually 3 per cent. and between 10 and 16 c.c. for each 100 c.c. of blood that is to be taken. This amount varies, the maximum being 350 to 400 c.c. After the amount of blood needed is withdrawn it is mixed, by the doctor, with the citrate solution by stirring it very gently with a lubricated, sterile glass rod. The blood is then usually filtered (*in*

case it should contain any small clots) through sterile gauze into a sterile flask. If the blood is to be transfused immediately the flask is kept in a basin of hot water (about 120° F.) in order that the blood may be kept warm; if the blood is not to be used at once, the flask is tightly stoppered with sterile absorbent cotton covered with sterile gauze.

Equipment.—(1) The articles needed for the preparation of the arms, a separate set should be provided for donor and recipient: (a) the usual detergents and disinfectants for the skin and the sterile sponges and swabs for applying these; (b) 3 sterile towels; (c) a tourniquet to distend the veins as described under intravenous infusion; (d) a local anesthetic, usually either cocaine or novocaine in a hypodermic syringe.

(2) For each patient (donor and recipient) a basin of hot sterile salt solution, 6 sterile sponges, a fluff of sterile gauze, and a bandage, these are for use after the operation is completed.

(3) Sterile gloves for the operator and each of his assistants, also the operator may desire a sterile gown or apron.

(4) Sterile albolene in a sterile glass and, if the Lindeman method is not used, a sterile syringe with which to draw the albolene into the needles, etc.

(5) The apparatus for the transfusion. If the Lindeman method is used a number of syringes and Lindeman canulas. If the Lewisohn method is used, warm sterile sodium citrate solution (the percentage and amount are specified by the physician); a graduated glass for measuring the solution; venopuncture needles, usually 2 heavy base and 2 small base are prepared; rubber stopper to fit the flask into which the blood is received with glass and rubber tubing attachment; 2 graduated flasks, one to

receive the blood and the other, in the top of which gauze is suspended, to be used if it is necessary to filter the blood; a deep basin containing hot water in which the flask of blood is put to keep warm; a glass stirring rod. All of these articles must be sterile.

The operation is performed by the physician and the nurses' duties are about the same as during an intravenous infusion.

Items of special importance for the nurses assisting to remember are.—The strictest asepsis is to be maintained; both donor and recipient must be made comfortable and, if necessary, their arms must be held to prevent jerking; the nature and simplicity of the operation should be explained to the donor so that he will be reassured; the condition of both donor and recipient must be carefully watched—symptoms denoting that the donor is suffering from loss of blood are: increasing rate and weakness of the pulse, pallor, and rapid breathing; signs that the recipient is being adversely affected are: flushing of the face, headache, muscular pains, and nausea, and later there may be urticaria and a chill followed by a rise of temperature, the reason for these symptoms is not definitely known, it is thought that they may be occasioned by some incompatible quality in the donor's and recipient's bloods or, sometimes, to the injection of a surplus amount of blood.

Both donor and recipient must be kept very quiet for some time after the operation and the donor should not be allowed to get up until given permission by the physician.

Chart the names of the physicians who gave the transfusion, the method used, the name of the donor, the amount of blood transfused, the condition of both recipient and donor during and after the transfusion.

Demonstration 91

Intravenous Injections. Administration of Salvarsan and Neo-Salvarsan

Requisites for intravenous injections.—(1) A tray containing the requisites for disinfecting the skin (see Chapter X). (2) A sterile tray prepared as described in Chapter X. containing a sterile Luer or record syringe and needles (the size required will depend upon the amount of drug that is to be given). (3) Three sterile dressing towels other than those used to cover the tray and utensils. (4) A sterile rubber bandage or a piece of small diameter rubber tubing (about one half yard) and an artery clamp. (5) Sterile rubber gloves. (6) The drug required. (7) Sterile sponges. (8) A sterile swab. (9) A sterile compress. (10) A gauze bandage.

Requisites for salvarsan injection.—(1) A tube of salvarsan. (2) A file to open the tube (*the tube and file are placed in alcohol so that they will be sterile when needed*). (3) A flask of hot sterile salt solution, 0.5%, made from chemically pure sodium chlorid and sterile, freshly distilled water. (4) A flask of hot distilled water. (5) Sodium hydroxid, 15%, in a glass stoppered bottle. (6) A medicine dropper. (7) A glass graduated liter measure. (8) A glass stirring rod. (9) A funnel with (10) sterile cotton or filter paper placed in it. (11) The articles necessary for giving the solution, these, as salvarsan is generally given as an intravenous infusion, are usually the same as those mentioned in Demonstration 90. With the exceptions mentioned in Demonstration 90 everything should be sterile.

Requisites for a neo-salvarsan injection.—(1) A tube of neo-salvarsan. (2) A file to open the tube

(*these are placed in alcohol so that they will be sterile when needed.* (3) A flask of sterile, distilled water. (4) A sterile graduated glass in which to mix the solution. (5) A sterile glass stirring rod with which to mix the solution. (6) The articles necessary for disinfecting the skin. (7) The articles necessary for injecting the solution (these may be either those required for an intravenous infusion, or an intramuscular injection, or an intravenous injection).

Intravenous Injections

As stated in Chapter XV drugs are sometimes injected directly into a vein. This method of administration is known as an intravenous injection.

An intravenous injection is always given by the physician, and the nurses' duties consist in preparing the required articles and the patient and assisting as requested.

The needles are usually prepared by boiling for five minutes, the care necessary when doing this has been already described, only one needle is required for the operation, but it is customary to prepare two in case one should be accidentally blunted or rendered unsterile. If the syringe is of a variety that can be boiled it is sterilized by boiling for 5 minutes, it must be put into the sterilizer while the water is cold and not allowed to touch the latter; if it cannot be boiled it is usually sterilized by alternately filling it with and then expelling alcohol (70 per cent.), at least 6 times, and then leaving it immersed in and filled with alcohol for ten minutes. The drug is generally heated by placing the ampul or bottle in a pan of hot water. The other utensils are sterilized as described in Chapter X.

One of the large veins in the front of the elbow joint is the usual site chosen for the introduction of the drug

and the area is prepared in the same manner as for an intravenous infusion, including the application of the tourniquet or a substitute.

The doctor usually fills the syringe and connects it and the needle after he has donned rubber gloves and if these procedures are relegated to a nurse she must put on sterile gloves before carrying them out, for the most careful asepsis is imperative, she must also make sure that air is expelled from the syringe, this is done in the same manner as when filling a hypodermic syringe.

As soon as the doctor inserts the needle in the vein the tourniquet is loosened, this is usually done by a nurse.

After the doctor withdraws the needle the area of puncture is painted with collodion.

Preparation for Injections of Salvarsan and Neo-Salvarsan

Salvarsan and neo-salvarsan are arsenic preparations that are used chiefly in the treatment of syphilis, but also in severe attacks of other diseases in which arsenic is of benefit, for these and the action of arsenic see Materia Medica. **The usual dose** of salvarsan is between 3 and 10 grains (0.2–0.6 gm.) and of neo-salvarsan 5–15 grains (0.3–1.0 gm.).

Salvarsan is now usually given intravenously in the same manner as an intravenous infusion and neo-salvarsan as an intravenous or an intramuscular injection, but occasionally it is more highly diluted and given as an intravenous infusion. The only necessary difference between the preparation for the injection of these drugs and the methods already described is in the preparation of the drugs and this is usually done by the doctor at the time of administration.

The method of preparing salvarsan varies somewhat, but a common one for the American preparation of the drug is as follows: About 40 c.c. of hot, sterile, distilled water is put into a sterile graduated glass measure or flask; the file and the tube containing the drug are taken from the alcohol and dried with a sterile towel and about half the quantity of salvarsan required is put into the water which is then thoroughly mixed with the powder by stirring or by shaking the container and, when the drug is thoroughly dissolved, the remainder of the amount desired is added and likewise treated. To this solution is now added, drop by drop, using a medicine dropper, and stirring the solution between the addition of each drop, enough 15% sodium hydroxid solution to dissolve the precipitate which forms when the first drops are added and to make the solution slightly alkaline (*the reaction is tested by letting a drop fall from the mixing rod on litmus paper*). This usually necessitates twenty drops for a solution containing 0.5 gm. (7½ gr.) of salvarsan. When the solution is absolutely clear it is diluted with 0.5% hot salt solution— 50 c.c. (1⅔ ounces) being used for each 0.1 gm. (1½ gr.) of salvarsan. The funnel is placed in the intravenous reservoir, sterile absorbent cotton or filter paper put in the former, and the solution filtered. The temperature of the solution usually prescribed is about 105° F.

The preparation of neo-salvarsan consists in putting the amount of drug required into a sterile graduated measure, adding the necessary quantity of warm (about 90° F.) sterile, freshly distilled water, stirring this with the sterile glass rod until the drug is completely dissolved, and then pouring the solution into the syringe or flask from which it is to be administered. For an intravenous injection about 3 c.c. of water are used for each 0.15 gm.

of the drug; for a concentrated intravenous injection about 10 c.c. of water and 0.45 gm. to 0.6 gm. of neo-salvarsan are used and, for an infusion about 25 c.c. of water are used for each 0.15 gm. of neo-salvarsan.

CHAPTER XVIII

Aspiration. Paracentesis or Puncture. Phlebotomy, Etc.

Nature and purposes of, and preparation for aspiration, paracentesis or puncture, and phlebotomy. Causes of abnormal collections of fluid in body cavities. The procedure in using leeches and reasons for their use.

Demonstration 92

Aspiration. Paracentesis or Puncture

By aspiration is meant *the removal of fluid from a cavity by means of an aspirator*, *i. e.*, an apparatus, as a syringe or a bottle, such as shown in Fig. 45, in which a vacuum can be created. The operation consists in inserting a hollow needle through the external surface into the cavity and creating a vacuum in the apparatus attached to the needle, whereupon, as the pressure in the cavity is greater than that in the aspirator, the fluid is forced through the needle.

By paracentesis is meant *the surgical puncture of a cavity for the removal of fluid.* Thus, the essential difference between the two operations is that, in the former, a vacuum is created in an appliance connected with the needle inserted in a cavity and. in the latter, the fluid is expelled from a cavity through an inserted needle or

canula by reason of the pressure within the cavity, without the creation of a vacuum to further its extraction.

The therapeutic use of these treatments is to remove excess fluid from closed body cavities. **Fluid is also withdrawn** for examination as an aid to diagnosis and, when it is desired to inject drugs into the spinal canal either for local treatment or to produce anesthesia, an amount of fluid equal to that which is to be injected is first removed, either by puncture or aspiration, to prevent pressure on the nervous tissue by increasing the amount of fluid in the canal above normal.

Under normal conditions there is, according to the size of the individual, about 60 to 200 c.c. of cerebrospinal fluid in the cranial and spinal cavities (*see textbook of physiology for its several purposes*), but in the serous cavities (pleural, pericardial, and peritoneal), the rate of secretion about keeps pace with absorption, the only purpose of the secretion being to supply a lubricant to prevent friction between the serous membranes lining the walls of the cavities and covering the organs. In inflammatory conditions of the membranes, however, there may be excessive secretion and interference with the absorption of secretions and the fluid transuding from the blood-vessels and this, especially the latter defect, may be partly **responsible for the accumulation of fluid in the cavities,** but the chief cause is the excessive transudation of fluid from the blood-vessels of the affected part. **The excessive transudation may be due to** (1) abnormal conditions of the walls of the blood-vessels which increases their permeability; (2) abnormally high blood pressure in the vessels supplying the affected cavity, this is usually the result of damming back of the blood in these vessels as the result of either (a) heart diseases that interfere with the proper emptying of the

veins into one or both of the auricles, (b) pressure on veins by a tumor or enlarged organ, (c) abnormal conditions of the liver which interfere with the portal circulation; (3) abnormal conditions of the blood such as may exist in severe anemia, nephritis, and diseases of the liver. All these causes of excessive transudation may coexist.

Accumulation of transuded fluid in any of the serous cavities is termed *dropsy*, but special names are applied to the condition in different cavities, *e. g.*, abdominal dropsy is termed *ascites;* liquid in the thoracic cavity is known as *hydrothorax* or, when it is associated with pleurisy, the condition is known as *pleurisy with effusion*, or, if the effusion becomes purulent, *empyema;* an effusion of liquid within the cranium is termed *hydrocephalus*.

Aspirations and punctures are always performed by the physician, and the nurses' duties consist in preparing the utensils and patient, giving the doctor the help required, and watching the patient's condition. The last-mentioned duty is very important when a large amount of fluid is removed, for, unless care is taken, fainting, or even a more serious stage of collapse, may occur. Nor is the danger over with the operation, and, therefore, a patient needs careful watching and must be kept very quiet for several hours following it. The principal cause of collapse is the effect produced upon the circulation by the removal of the pressure from around the organs in the affected cavity and, as lung tissue will expand more readily than that of other organs, and thus favor a sudden inrush of blood, this is particularly likely to occur during aspiration of the pleural cavity.

Points of special importance to remember in addition to that just mentioned are: That (1) any break in asepsis may cause the sterile serous fluid in the cavities to become

purulent; (2) it is downright cruelty to provide needles that are the least bit blunt[1]; (3) for an abdominal puncture the bowels and bladder must be as empty as possible for, if they are distended, there is some danger of their being punctured. For this reason a patient must always void urine just before the operation and as, for anatomical reasons an empty bladder is even more important with women than men, some physicians require the former to be catheterized. Also, it is the rule in some hospitals that an enema be given a short time before this operation. Where there is no such rule, a nurse must ascertain when the patient's bowels moved last and, if there is any reason to believe that catharsis is necessary, report the fact.

It would be impossible to demonstrate these operations in class, but the utensils required, the positions in which the patient is to be placed for the different ones, the necessary preparations and the reason for these are to be learned.

Demonstration 93

Aspirations and Punctures

Requisites for aspiration.—1. The articles required for disinfecting the skin, see Chapter X.

2. A local anesthetic, either novocaine or ethylchlorid is generally used.

3. Two aspirating needles.[2]

[1] To avoid any necessity for doing so (1) never allow the point of a needle to come in contact with anything hard, (2) examine needles before putting them away after use and, if one is blunt, take it to the head nurse or whoever is responsible for making exchanges; do not put away a needle that is unfit for use, (3) examine needles before preparing them for use.

[2] Though only one needle is required, two, of different caliber, are usually prepared.

4. The aspirating apparatus. This, when only a small quantity of fluid is to be withdrawn, is usually a Luer or similar syringe, but if any considerable quantity of fluid is to be taken it is either a bottle, in which a vacuum can be created by means of a pump, with the cork tubing and pump, as shown in Fig. 45, or else a piece of tubing about one quarter of an inch in diameter and eighteen inches long, in one end of which is a metal piece that will allow of the tubing being attached to the aspirating needle and a large-sized glass syringe with a long, blunt point that will fit securely into the free end of the tubing.

5. A utensil to receive the extracted fluid. This, when a syringe is used is generally a sterile test-tube plugged with sterile cotton[1] and, when a large amount of liquid is to be extracted a sterile bottle, the mouth of which is kept plugged with sterile cotton until the bottle is needed,[2] or, if the so-called *vacuum bottle* is used it will answer the purpose.

6. About three sterile sponges.

7. Two sterile towels other than those used to cover the tray on which the sterile utensils are to be placed, as described in Chapter X.

8. A sterile basin containing sterile water with which to test the aspirating apparatus.

[1] One or other of the appliances last mentioned is nearly always used for aspiration of the pleural cavity, except when the aspiration is performed merely to see if there is fluid in the cavity or to obtain a small amount of fluid that is known to be there for examination. When the aspiration is performed for these purposes it is commonly called an *exploration*.

[2] As a rule the utensil is to be kept sterile inside as well as out, to avoid contamination of the fluid for this is usually examined for diagnostic purposes and it is sometimes used as a basis for certain culture media.

9. Two pair of sterile gloves.

10. A pair of sterile forceps with which to handle the needle and dressing.

11. A surgical dressing. This usually calls for either collodion and a sterile swab or a small, sterile gauze compress and two strips of adhesive plaster about five inches in length and two in width.

12. A receptacle for soiled sponges, etc.

13. A shoulder wrap.

14. Stimulants if ordered.

For the aspiration of a vein, there will be needed in addition a rubber bandage, or a piece of rubber tubing and an artery clamp, to be used as described under an intravenous injection, and a gauze bandage for the dressing. The shoulder wrap will not be required.

Requisites for a lumbar puncture.—The same as for an aspiration except that two lumbar puncture needles and sterile test tubes in a test tube stand are substituted for the aspirating apparatus.

Requisites for an abdominal paracentesis.—1. Articles required for disinfecting the skin.

2. A canula and trocar.

3. Rubber tubing about one and a half yards long, which is attached to the projection of the canula that is not blocked by the trocar.

4. Scalpel.

5. Probe.

6. Scissors.

7. Two suture needles.

8. Artery clamp, this is rarely used, but it should always be provided in case of hemorrhage.

9. Forceps.

10. Local anesthetic, either novocaine or ethyl chlorid is generally used.

11. Two large sterile bottles which are kept plugged with sterile cotton until required or, if it is not essential to keep the fluid sterile, a pail.

12. A small package of (or about twelve) sterile sponges.

13. Suture silk.

14. Two sterile towels other than those used for the tray on which the sterile articles are placed.

15. A sterile dressing consisting of three or four large fluffs of sterile gauze and two pieces of absorbent cotton.

16. Adhesive plaster.

17. Two binders one of which must be sterile and a scultetus.

18. Four sterile safety pins.

19. Two dressing rubbers.

20. Two blankets, only one will be required if the patient is not able to sit up in bed.

21. A board about two feet wide, to put across the bed under the springs to prevent the latter sagging.

22. Laparotomy stockings.

23. If the patient sits up in bed, a back rest, or else about six extra pillows, and a bandage or heavy twine; if the patient is to lie down during the operation, only three extra pillows will be needed.

24. Two stools for the patient to rest her feet on; these will not be needed if the patient does not sit up.

25. Stimulants if ordered.

Requisites for the puncture of a vein (commonly known as *phlebotomy*):

1. Tray with articles required for disinfecting the skin.

2. Scalpel.

3. Aneurism needle.

4. Two artery clamps.

5. Probe.
6. Scissors.
7. Sterile graduated glass pint measure to receive the blood.
8. Suture needles.
9. Catgut.
10. Suture silk.
11. Sterile rubber bandage or piece of tubing and artery clamp.
12. Two sterile towels.
13. Sterile sponges.
14. A basin of sterile salt solution or water, to wash the blood from the arm be ore putting on the dressing.
15. A bandage.
16. Dressing rubber.
17. Receptacle for soiled sponges, etc.

All the articles except the two last mentioned are to be sterile.

Preparation of apparatus.—The only preparation that has not been described in either Chapter III. or Chapter X. is the testing of the apparatus for aspiration. This is most important and should be done both before and after the articles have been sterilized because they get out of order easily. The needles need not be tested after sterilization, for, if the wires are in them, their lumen must be free, but they should be examined before they are sterilized.

To test the syringe, when this is the appliance used, draw some of the sterile water into it and then expel it. If the syringe is in order the piston will move easily, but will not be loose, the water will come up as far as the piston is pulled back, and there will be no air bubles in the water.

When the vacuum bottle is the appliance used, put

the cork in the bottle and attach the tubing to the metal projections in the cork. Put the projection of the pump on which the arrow[1] points upward into one of the pieces of tubing, open the stop-cock in the metal piece of the cork above the tubing to which the pump is attached and close the one on the other side. Exhaust the air in the bottle by pumping until the pump grows hard to work (*while doing this after sterilization hold the pump so that the air forced from it will not go over the sterile articles, for it is not sterile, and do not put the pump down where it will come in contact with the needles, dressing, or sponges*[2]), close the open stop-cock and open the other one.[3] If the apparatus is in working order the water will flow from the basin into the bottle. Empty the water from the bottle into the basin, change the order of the stop-cocks, once more exhaust the air in the bottle and close the open stop-cock. Leave the basin of water on the tray as the doctor may want the apparatus tested again before he attaches the tubing to the needle. This is usually done by the nurse while the doctor is introducing the needle.

If the tubing and syringe are to be used as an aspirator, attach them, putting the nozzle of the syringe into the end of the tubing that has no metal piece, put the free end of the tubing in the basin of water and draw back the piston of the syringe; if the syringe is in order and the lumen of the tubing clear, the water will be readily forced through the tubing into the syringe. Disconnect the syringe and

[1] The majority of exhaust pumps used for this purpose have two projections, on each of which there is an arrow which points in the direction that the air will go as it is forced from the bottle.

[2] Exhaust pumps cannot, as a rule, be properly sterilized or disinfected because if liquid enters the valves the washers shrink and then the pump does not work properly.

[3] This is the end that will be attached to the needle during the operation.

tubing, for, as a rule, they are not wanted connected until after the needle has been inserted.

Care must be taken while testing the apparatus after sterilization not to let any of the articles come in contact with anything unsterile.

Preparation of Patient for Aspirations and Punctures

Necessary Disinfection.—The skin at and surrounding the area in which the puncture is to be made is shaved if necessary and then washed with soap and hot water and, following this, with first ether and then alcohol. If this is done such a short time before the operation that the skin would not be dry enough to allow of iodine being effectual, a compress wet with alcohol or other disinfectant is placed over the area. If, however, it is finished earlier nothing further is done until the physician is nearly ready and the patient is in position when the area is painted with iodine 3%. When shaving is not necessary the preliminary washing is sometimes omitted, this of course depends upon the physician's wishes.

For aspiration of the pleural cavity the needle is inserted between the ribs either in the back below the angle of the scapula or on the side between the eighth and ninth, or the seventh and eighth ribs. As the point of insertion varies somewhat, unless definite directions are given regarding the area of skin to be prepared, it is usual to include the space from within an inch of the spine (on the affected side) to about an inch beyond the axilla and from the lower end of the scapula to about an inch above the waist line. The operator may want the patient to be placed in either a sitting or a semi-recumbent position. If the former, when the doctor is nearly ready, have the patient sit up near the side of the bed on which the operator will stand, remove the nightgown from the arm of the

affected side and arrange it so that it will be out of the way, but cover the other side of the chest and back, with a shoulder wrap. Have the patient lean forward and place the hand on her affected side on her opposite shoulder. This position increases the width of the intercostal spaces. If the patient is to be in the semi-recumbent position, draw her to the side of the bed and place her on her side, leaning considerably forward, if the puncture is to be made in the back. Arrange the pillows so that her head and shoulders will be higher than the point of puncture[1] and have her shoulders bent forward, as when she was sitting up, and her hand of the affected side resting on her opposite shoulder or on a pillow placed on a level with the latter. Disinfect the skin, as already described and surround the area with sterile towels.

For aspiration of the pericardial sac, the needle is usually inserted between the fourth and fifth or the fifth and sixth ribs close to the margin of the sternum on the left side and the skin is to be disinfected from the median line to about two inches beyond the margin of the sternum and from the third to the seventh rib. The patient either lies on her back with a pillow under her head and shoulders or is propped in a sitting position

The aspiration of a vein is performed to obtain a specimen of blood for examination or instead of phlebotomy, this is described later. One of the veins in the bend of the elbow of the left arm is usually chosen and both the preparation of the patient and the operation are similar to an intravenous injection, described page 529,

[1] It will be noticed that the puncture is always made near the lowest level of the cavity from which fluid is to be extracted. This is because the liquid gravitates to the floor of a sac. A sitting position naturally favors this and, thus, it is sometimes preferred, but the recumbent position is much less trying to the patient.

the differences being that, instead of having a liquid in the syringe, the piston is inside and, after the needle has been introduced into the vessels, the piston is drawn backward and blood thus aspirated.

For the withdrawal of fluid from the spinal canal (lumbar puncture) a lumbar puncture needle is inserted between the fourth and fifth lumbar vertebræ (*it is because of the location of the puncture that the operation is known as lumbar puncture*), and the skin is to be disinfected for about two inches on all sides of this point. In order to facilitate the insertion of the needle, the laminæ of the vertebra must be separated and to do this the back must be curved, therefore, if the patient is to lie down,[1] place her at the edge of the bed or a table with her knees drawn up toward her chest and her shoulders bent forward. If the patient is to sit up, place a bed table across the bed, put a pillow on it, and have the patient lean forward and rest her arms on this. Arrange the patient's nightgown so that her back, but not her chest, will be exposed; place a folded dressing towel on the bed just below the point of puncture. Put a shoulder wrap across the upper part of her back and shoulders and a sterile towel over this. Sometimes, if the patient is well enough, the doctor wants her out of bed, in such case, have her sit on a straight backed chair, facing the back, with the buttocks close to the edge of the chair. The patient must be suitably clothed and sterile towels pinned around the area of operation.

For abdominal paracentesis the puncture is usually made in the linea alba, midway between the umbilicus

[1] This position is nearly always used for a child, as its movements can be more easily controlled than when it is sitting up, and for a patient whose condition is poor, but, as an upright position greatly facilitates the flow of fluid, it is generally used when possible.

and the pubes and, unless other directions are given, the area of the skin prepared includes two or three inches on each side of the central line from an inch or two below the umbilicus to just above the pubes. Except in the case of children shaving is usually necessary and the method of preparation very commonly used is as described on page 349. As stated on page 552, catharsis has to be considered and the patient is to void urine or be catheterized just before being placed in position.

When possible the operation is done with the patient sitting on the edge of the bed with her legs over the side. To arrange the patient in this position, put on laparotomy stockings, draw her to the edge of the bed, have her sit up with her legs over the side and, if necessary move her so that she will be near enough the head of the bed to lean against it if she wishes to do so. Place stools for her feet. Put a blanket around her legs and one around her body, pin back the lower ends of the latter so that her abdomen will be exposed. Put a back rest[1] behind her and secure this in place; this can be done by tying a piece of strong bandage or cord through the lower bar of the rest on each side, bringing these strings forward and tying them to the bar on the side of the bed on which the patient is sitting. Put a dressing rubber over the blanket, bare the abdomen.

A nurse, who, in the meantime, has disinfected her hands, should paint the required area with iodine. Place a sterile towel over the rubber, and pin another around the blanket (using sterile safety pins), above the abdomen.

[1] If a suitable rest cannot be obtained, pile five or six pillows one on top of the other, tie a bandage or cord around them, on each side, to hold the pile together, and then tie the free ends of the strings to the bar at the side of the bed on which the patient is sitting.

Put the sterile scultetus binder[1] around the loins and, in order that the front of this may be kept sterile roll a sterile towel around the end that must be passed behind the patient; pin with sterile safety pins two or more of the tails of the binder in the front, but toward one side, leaving an exposed space of about five inches at the area for the puncture. Remove the plug from one of the bottles and place the plug on the sterile towel (it will be needed again if the fluid is to be saved as is usually the case when sterile bottles are used), and the bottle where the rubber tubing that is attached to the canula can be put into it as soon as the canula is inserted in the puncture, and the sterile nurse usually does this while the doctor is manipulating the canula.[2]

If the patient is unable to sit up, draw her over to the side of the bed, put a dressing rubber covered with a towel under her, turn her on her side, place pillows against her back, turn the bed covers down below the abdomen, put a small blanket or nightingale across her chest, put a dressing rubber over the covers at their contact with the abdomen. The nurse who has disinfected her hands then performs the same duties as when the patient is sitting up.

The operation consists in making a small incision with the scalpel, inserting the trocar and canula into the wound and withdrawing the trocar, whereupon, the liquid in the cavity flows through the canula and tubing into the re-

[1] The purpose of this binder is to hold the abdomen forward and thus prevent pocketing of the fluid and it is to be tightened during the operation when the shrinking of the abdomen following the loss of fluid causes it to become loose.

[2] If the fluid is not to be saved a pail is generally used and the unsterile nurse puts this in place. It is generally stood on the floor or a stool near the patient's feet.

ceptacle provided for it. After the operator removes the canula a piece of sterile gauze is put over the wound and the patient is to be made comfortable in bed, then the rest of the dressing, which usually consists of two or three gauze fluffs and pieces of cotton, is strapped in place with adhesive plaster and an abdominal binder is put on and pinned as tightly as the patient can stand it. This is important in order to avoid disturbance of the circulation by the too sudden relief of the pressure on the intra-abdominal veins. The dressing must be watched and changed when necessary as there is likely to be considerable oozing.

Phlebotomy or venesection is the puncture of a vein for the withdrawal of blood. It is performed to relieve an excessively high blood pressure and to remove toxic blood from the body—as in gas and uremic poisoning. In the latter case the phlebotomy is usually followed by an intravenous infusion.

The operation consists in making a puncture in one side of a vein with, usually, a scalpel and allowing blood to flow into a sterile graduated measure. When the amount required has been withdrawn the wound is sutured and a sterile dressing applied. The vein chosen is usually one of those in the inner bend of the elbow and the preparation required is the same as for an intravenous injection, described on page 532.

One of the nurse's principal duties when assisting with any of these treatments is to care for the patient. She must, for the reasons given on page 551, watch for symptoms of faintness and be ready to restrain the patient's movements if necessary; a child usually has to be held and, if it is conscious, means taken to divert his attention throughout the operation. When the patient has to be restrained there should be a second nurse to assist the

doctor. The assistant's hands should be disinfected. The assistance generally needed is to (1) hold or place the receptacle for the reception of the fluid taken from the cavity; (2) during an abdominal paracentesis tighten the binder as it becomes loosened; (3) apply the dressing at the conclusion of the treatment.

What is to be done with the receptacle for the fluid depends upon the apparatus used and the position of the patient. If the vacuum bottle is used it is left on the tray or table and, the nurse pumps the air from it, as already described; if tubing, attached to the needle, and a syringe are substituted for the vacuum bottle, after the doctor introduces the needle into the cavity he inserts the syringe in the free end of the tubing, draws back the piston until the liquid appears in the syringe and, if possible, the nurse then removes the plug from the bottle and holds the latter under the connection of the tubing and syringe, whereupon the doctor removes the latter and puts the end of the tubing and the contents of the syringe into the bottle. If the patient is sitting up the bottle is usually placed beside her on the bed or on the table, but if she is lying down it is usually necessary to put it lower, because it must be far enough below the needle for the attached tubing to hang perfectly straight, and it may be placed on a stool or tied to the bar at the side of the bed. If all the fluid withdrawn is taken into a syringe, the nurse, at the conclusion of the operation, may be expected to remove the plug from a test tube, hold the latter while the doctor forces the fluid into it from the syringe, and reinsert the plug. If the fluid is to flow directly from a needle or canula into the receptacle (as is usual in lumbar puncture) the latter is held just below the exit of the former.

To remove a sterile plug from a tube if it is to be re-

inserted at once take the latter in your left hand, take the upper part of the plug between two of the fingers of your right hand in such a manner that the portion which fits into the tube will project from behind your fingers and not touch your hand or anything else, pull it out and hold it thus. When replacing it be careful not to let it touch anything. When the plug is not to be reinserted at once, take it out in the usual manner, place it on the sterile towel covering the tray and put a corner or fold of the towel over it so that nothing unsterile will come in contact with the part that is to be reinserted. Of course, these precautions are only necessary when the fluid is to be sent to the laboratory.

The dressing, when the wound has been made with a needle, usually consists of an application of collodion[1] and a gauze compress strapped on with adhesive plaster, except when the wound is on an arm, when the collodion is omitted and the compress is bandaged in place. The dressing used after abdominal paracentesis has been already described.

Care of fluid that is to be sent to the laboratory.—Fluid taken from the chest or peritoneal cavity should be well shaken as soon as withdrawn to prevent clotting. Specimens of spinal fluid should be taken to the laboratory immediately, because the leucocytes degenerate quickly and cannot then be counted and this is one of the essential items in examination of the cerebrospinal fluid.

Items to be recorded on the patient's chart are the nature of the treatment (*aspiration or puncture and location*), the name of the operator, the amount of fluid withdrawn and its appearance, and the condition of the patient during and following the treatment.

[1] The collodion is used because, unless a bandage or binder is put on, the compress does not stay in place well.

Leeches

In the past leeches were much used to extract blood both for the relief of systemic conditions associated with high blood-pressure and to lessen local congestion. They are, however, rarely used at the present time, phlebotomy or aspiration of a vein being substituted for the former purpose and bleeding for the relief of local congestion is a form of treatment seldom employed at present and, when it is, the usual method is to make a small incision in the skin and apply a Bier's cup (wet cupping). The modern methods have at least four advantages, viz., they are more aseptic, they are less repellent to the patient, the amount of blood taken can be better estimated and controlled; there is, ordinarily, no danger of hemorrhage following them and there is after the use of leeches because the latter secret a ferment that lessens the coagulable property of the blood and inject it into the tissues of the part to which they are applied. The application of leeches can hardly be shown in class and the majority of pupils during their entire training will not see them used but the procedure is simple and they should be able to put the following instruction into practice if occasion arises. The most common use of leeches at the present time is for the relief of congestion around the eye and ear when small Bier's cups cannot be obtained. One or more may be used at a time, the doctor specifies the number.

Leeches are kept in a jar containing water and sand supplied with a perforated cover—the latter must be kept on or the leeches may crawl out. About an hour[1] before they are to be put on take the leeches needed from

[1] This is because they will usually take hold more readily if they have been deprived of water and food for some time.

the water and place them in test tubes or small bottles. Tie gauze over the openings to prevent the escape of the leeches (corks should not be used as the leeches need air).

Cleanse the patient's skin as when an incision is to be made and disinfect it with bichlorid or other odorless disinfectant.[1] Just before applying the leeches smear the skin with some sterile sugar solution using a sterile sponge. The leeches will bite more readily if this is done.

To apply a leech, see that its head[2] is toward the opening of the tube, take off the cover, and hold the tube tilted on the part where the leech is wanted attached. If necessary, shake the tube a little to make the leech come out, but disturb it as little as possible. Never place a leech over a visible vein nor in a part where pressure cannot be made against a bone if there is hemorrhage; if one is put near an ear put a piece of cotton in the latter for occasionally a leech will wander from the part tc which it is applied or gauze can be put loosely over the leech and secured in place with adhesive plaster put around its edge, or a pill box, with holes in it to admit air, can be strapped over the leech. Never attempt to pull a leech off once it has taken hold, or it may leave its sucker in the wound and thus cause a serious inflammation. If it is to be removed before it lets go put a little salt on its tail; this will make it fall off. If left undisturbed, a leech will drop off after it has taken as much blood as it can. After use, put all the leeches in an empty paper bag or bottle and kill them by covering them with salt.

After the leeches are off, if they have taken sufficient

[1] The leeches will not bite the skin if there is an odor to it.

[2] The head is a little bit less pointed than the tail and there are two minute projections at the mouth.

blood, paint the part with iodine (3%) and apply a sterile gauze dressing. When enough blood is not withdrawn, the doctor sometimes orders the application of hot compresses as these will encourage bleeding, but this should not be done without an order as it increases the possibility of hemorrhage. Should hemorrhage occur, make firm pressure over the part and send word to the doctor. A common prescription is to inject a little adrenaline into the wound.

CHAPTER XIX

Bandaging, Etc.

Bandages and bandaging. The nature and uses of binders and slings. Strapping with adhesive plaster. The uses and application of splints. Traction and suspension.

Demonstration 94

Bandages and Bandaging

Requisites.—(1) Bandages of different widths and kinds. (2) Safety pins. (3) Scissors. (4) A bandage roller.

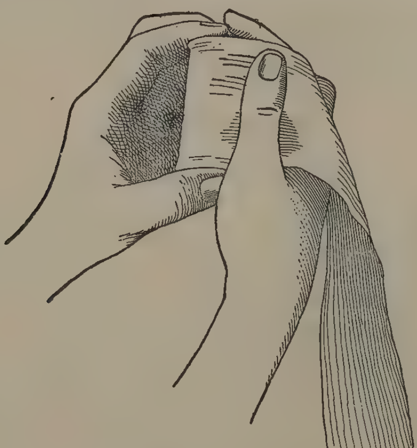
Bandages are used chiefly.—To keep surgical dressings, splints, poultices and the like in place; to control the circulation of blood in a part when there is hemorrhage or swelling; to limit motion and to afford support.

Gauze (cheesecloth) and muslin are **the materials most commonly** used for bandages, but various others are also employed; *e. g.*, crinoline impregnated with plaster which, when applied, constitutes what is known as a *plaster splint* or *cast*, flannelette, Canton flannel, and rubber, also bandages of a special loose-meshed material can now be bought at stores dealing in surgical supplies, that are particularly good for affording support to weak ankles and making pressure upon varicose veins and swollen parts. Gauze bandages are usually preferred to others for keeping surgical dressings in place, because they are lighter and cooler and more easily adjusted than

those of other materials, but the gauze is not firm enough to be used when pressure and support are necessary.

The average widths of bandages used for different parts of the body are: For the fingers, one inch wide; for the head, arm, and foot, two to three inches, according to the size of the patient; for the thigh and trunk, two and a half to four inches; for the heel, two to three inches.

Making bandages.—When bandages are made in large numbers they are rolled and cut by machinery but, for



63. Rolling a bandage by hand.

individual use, the material for a bandage can be cut or torn and rolled by hand. However, it must be properly rolled or the bandage will be difficult to adjust. The points of special importance are: The material must be smooth (without wrinkles) and tightly rolled and the selvage and ravelings removed. The selvage is removed before and the ravelings after the material is rolled. The reason for the removal of the selvage is that it does not

stretch as much as the rest of the material and thus increases the difficulty of getting uniform pressure. **To roll a bandage by hand** fold one end of the strip of material upon itself several times until a small, but firm, roll is formed. Then hold the free part of the strip between the thumb and index fingers of the right hand, hold the roll with the thumb of the left hand on one end and the first finger on the other, and rotate the roll until the bandage is completed.

Items of importance to remember when bandaging are: (1) A bandage must be put on tightly enough to insure its remaining in place, but it must never be so taut that it causes pain or, except when prescribed for the purpose, interferes with the circulation. (2) When there is a wound or acute inflammation a bandage is generally put on particularly loosely, but, when it is intended to afford support or pressure, it is usually put on as tightly as possible without causing the effects mentioned above. In such case it is particularly important that it be put on in such a manner that the pressure is uniform over the entire part that is bandaged. That it may be so, no one turn of the bandage must be tighter than another and each turn must overlap the other an equal distance. The first turn taken when starting the bandage is particularly likely to be made too tight unless care is taken to avoid it. (3) When bandaging a limb, the toes or fingers are left uncovered if possible, even when they are not to be moved, because their condition shows if the bandage is too tight. Indications that it is are a deep red or bluish color, and coldness of the parts below the bandage, a tingling sensation, and either numbness or pain. This precaution is especially important when there is inflammation because, even when the bandage is loosely applied, the swelling in the part may increase and make it too tight.

Before bandaging a joint that is to be immobilized, always place the extremity involved in the position in which it is to remain afterward. When bandaging the leg, always support it. For this purpose a sand-bag is a good substitute for the regular heel rest. When putting on a spica of the groin, place a folded pillow, or two or three sand-bags, under the upper portion of the back, so that the part under which the bandage has to pass back and forth will be raised from the bed.

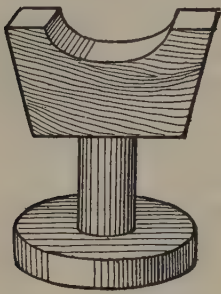


Fig. 64. Heel rest.

When bandaging, hold the bandage roll side upward in your right hand, begin to bandage at the distal end of the part to be covered and work upward. Always pin or tie a bandage so that the pin or knot will not come in contact with any part of the patient's body and where he will not lie upon it. To tie a bandage, tear or cut a few inches of the material, twist the two ends around each other, pass them in opposite directions around the limb and then tie them over the twist.

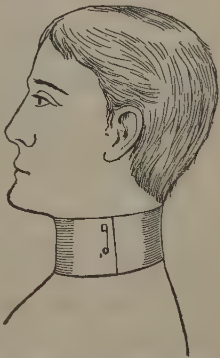


Fig. 65. Circular bandage.

The forms of bandages in most common use are what are known as the *circular*, *spiral*, *the spiral reverse*, *the figure-eight*, *and the spica*.

The circular bandage consists of two or three turns made around a part, each turn covering the preceding one. (See Fig. 65.)

The spiral bandage can be applied only to parts of about uniform circumference. It consists of circular

turns, each one made higher than the preceding one, but overlapping it about one half its width.

The spiral reverse is similar to the spiral bandage, but, in each turn, the material of the bandage is reversed, *i. e.*, turned over upon itself. To make the reverse, place the thumb of the left hand at the point where the reverse is

Fig. 66. Spiral bandage.

Fig. 67. Spiral reverse.

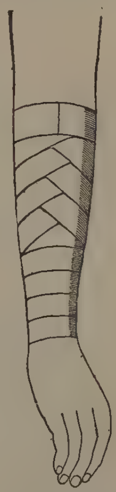


Fig. 67a. Forearm with simple spiral below and the reverse above.

to be made, pronate the right hand (in which the roll is held) and thus double the bandage upon itself, as shown in Fig. 67, and make sufficient traction on the bandage to draw the turn into place. Make each reverse directly above the preceding one. By thus reversing the bandage the turns can be adjusted to the contours of the body; this makes the spiral reverse a particularly suitable bandage for the legs and arms.

The figure-eight bandage consists of a series of oblique turns alternately ascending and descending and crossing

Fig. 68. Figure-eight bandage.

each other in such a manner that they form the figure-eight around the part. This forms the basis for many special bandages, such as those used on joints.

The recurrent bandage consists of a series of reverse turns passed back and forth across the part to be bandaged, each turn overlapping the other one half its width. The ends are secured by a circular turn around them. The recurrent bandage is used chiefly to retain dressings in place on the head, ends of the fingers or toes.

Fig. 69. Recurrent bandage.

To bandage the foot, take a circular turn around the ankle, carry the roll down over the top of the foot toward the toes, then under the foot near the base of the toes

and back over the top of the foot, crossing the second turn in the middle line of the foot, directly above the toes; pass the roll upward and back of the ankle, then down again over and under the foot as before. Continue the turns until the foot is covered, making each one higher than the other and covering the preceding one about half its width. It will be seen that this bandage is on the principle of the figure-eight.

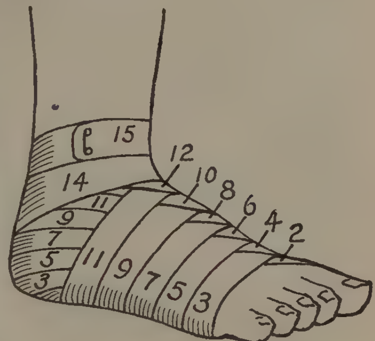


Fig. 70. Foot bandage.

If the toes are to be covered, place the initial end of the bandage on the instep, bring the bandage over the toes and to about the middle of the under part of the foot; take turns back and forth over the toes until they are covered; let each turn cover the preceding one at least two-thirds of its width; secure these turns in place with a circular turn around the foot, just above the toes, and then proceed to bandage the foot in the usual manner.

Fig. 71. Heel bandage.

To bandage the heel, use a 2½ inch bandage. Take a turn around the foot covering the heel; take a similar turn over this to fix the bandage; take another turn somewhat lower on the foot with its upper edge almost in the center of the preceding turn on

the heel; bring the bandage obliquely across the top of the foot and around the ankle, with its lower edge almost meeting the upper edge of the last turn on the heel; carry the bandage down obliquely over the top of the foot, crossing the upward turn in the middle line of the foot. Repeat these turns around the ankle and foot as often as necessary making each turn lower on the foot and higher on the ankle and covering each preceding turn at least one-half its width at the sides, and back of the foot, but the turns will almost overlap each other on the top of the foot. Finish with a circular turn around the ankle.

To bandage the leg, take two turns around the ankle and proceed up the leg with either reverse or figure-eight turns. It is well, especially if the patient is not confined to bed after making three or four turns (either reverse or figure-eight), to carry the bandage up and around the leg above the calf then down around the leg to above the regular turns and afterwards continue as at first. The turn around the calf helps to keep the bandage from slipping. The knee is covered only when necessary, in which case proceed as for the elbow bandage, see page 577.

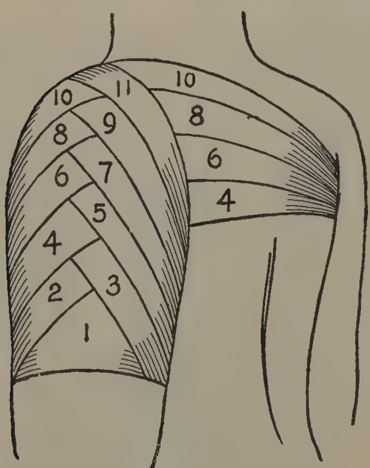


Fig. 72. Spica of the shoulder.

To apply a spica to the shoulder, fix the free end of the bandage by taking a couple of circular turns around the middle of the arm of the injured side, make one or more reverse

or figure-eight turns, then carry the bandage across (for the right shoulder) the chest or (for the left shoulder) the back, continue the turn around the body (passing under the armpit of the uninjured side) back to the injured side, pass the bandage obliquely around the arm on this side (forming the figure-eight) and then around the trunk as before. Continue to make these turns until the shoulder is covered. Overlap the turns on the arm one-half their width but converge the bandage as it crosses the chest and back so that the fold under the armpit will be narrow.

A spica for the thigh is put on in the same manner as the shoulder spica except that the turns around the trunk are carried upward to the waistline.

To bandage the arm take one or two circular turns around the wrist and then proceed up the arm with either figure-eight or reverse turns, do not cover the elbow unless necessary if the bandage is to be continued up the upper arm, when you reach the elbow, carry the bandage up on the inner side of the joint; take a circular turn around the arm above the joint and proceed as on the forearm.

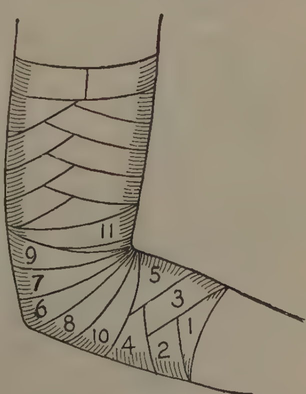


Fig. 73. Elbow bandage.

When the elbow is to be covered, discontinue the figure-eight or reverse turns about two inches below the joint, flex the forearm, carry the bandage upward and around the elbow, in a manner to have the point of the latter in the center of the bandage, bring the bandage

downward inside the joint and around the arm (keeping the upper edge of the bandage just below the point of the elbow), pass upward crossing the previous turn on the inside of the joint, pass around the elbow (keeping the lower edge of the bandage just above the point of the joint), and then bring the bandage downward again. Repeat the turns, making that on the forearm lower and that on the upper arm higher than the preceding ones, then take a circular turn around the upper arm, just above the elbow, and proceed with the figure-eight or reverse.

To bandage the hand without including the fingers, take a circular turn around the hand at the base of the fingers and, on reaching the back of the hand for the second time pass the bandage obliquely across it and around the front of the wrist, then down across the back of the hand, crossing the former turn in the middle of the hand, around the palm and up across the back of the hand again. Repeat the turns until the hand is covered, finish with a circular turn around the wrist.

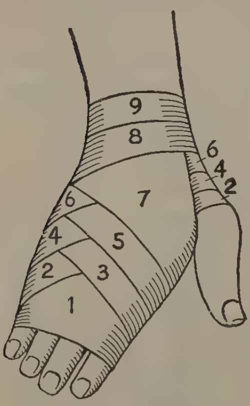


Fig. 74. Hand bandage, fingers not included.

To bandage the hand when the fingers are to be covered put gauze or cotton between the fingers and over the tops and, it is well to put powder on the cotton; these, if there is a wound, should be sterile. Place the free end of the bandage about the middle of the palm of the hand, in the center take a turn over the fingers, and down to the middle of the back of the hand, then take recurrent

turns, *back and forth*, across the tops of the fingers, first on one side and then on the other of the first turn. Hold these turns in place with the thumb and first finger of the left hand until the fingers are covered, then secure them in place with a circular turn and bandage the hand as previously described. If the thumb is to be bandaged it is usually done before the hand.

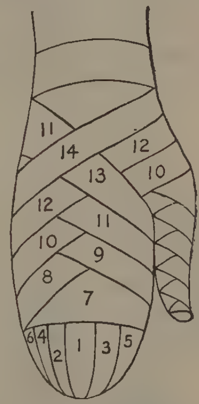


Fig. 75. Hand bandage. Fingers covered with recurrent bandage. Thumb covered separately and first with figure 8 or spiral reverse turns.

To bandage the thumb or a finger. —If the tip is to be covered, take two or three recurrent turns across the top and secure them in place with a circular turn, otherwise begin with the circular turn and proceed down the finger or thumb with either figure-eight turns or reverse. If more than one finger is bandaged and also the hand, it is customary to, after getting to the base of one finger, take a turn across the back of the hand, around the wrist, up the palm of the hand, then make a turn or two to carry the bandage to the top of the next finger that is to be bandaged and begin to bandage as on the first finger.

The Velpeau bandage is used to immobilize the shoulder and arm after such injuries as fracture or dislocation of the clavicle or fracture of the humerus. Two bandages each 2½ inches in width and 6–7 yards in length are required. Before applying the bandage dust the chest with powder, place a pad of gauze in the axilla of the affected side to absorb secretions and to help hold the shoulder in position, put a fold of gauze between the

arm and chest and roll the upper portion of this in a manner to comfortably support the hand on the shoulder. Have the patient sit upright and place the fingers of the affected arm on the shoulder of the uninjured side. Start the bandage on the back of the scapula of the well side. Carry it over the shoulder of the affected side, as far outward as possible, thence downward along the outer and posterior aspects of the arm, behind the elbow, obliquely across the front of the chest up below the axilla of the sound side and thence to the starting point. Repeat this turn in order to fix the first turn. For the third turn, on reaching the armpit carry the bandage transversely around the chest, crossing the arm and forearm close to the elbow (this turn presses the elbow against the trunk). On reaching the starting point repeat the first procedure covering about two-thirds of the inner portion of the first turn. Repeat the third procedure covering about one-half of the upper portion of that turn. Continue turns one and three, have each of the former nearer the center and each of the latter higher until the turns over the shoulder impinge upon the neck, finish with two or three transverse turns to bring the bandage over the lower part of the wrist and directly under the armpit.

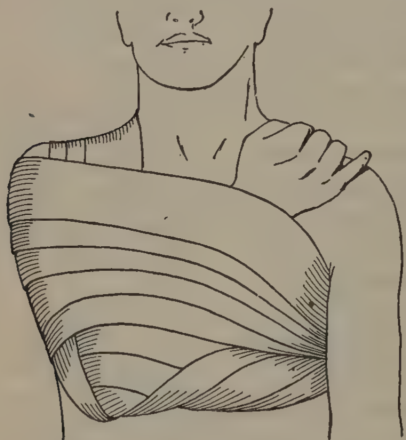


Fig. 76. The Velpeau bandage.

Single spica or suspensory bandage of the breast.— Powder the skin and place a thin layer of cotton over and under the affected breast unless it is already covered with a dressing. Place the initial end of the bandage below the affected breast and take two circular turns around the body somewhat below the breast. Then make alternate turns over the shoulder of the unaffected side and around the chest over the affected breast, keeping the circular turns below the sound breast and the shoulder turns above it. Make each turn higher than the preceding turn and overlap it about two-thirds. Continue until the affected breast is covered.

Fig. 77. Suspensory bandage for the breast.

Double spica of the breast.— Two bandages 2½ inches in width and about 6 yards in length are required. Prepare the chest as for a single spica. Place the initial end of the bandage beneath the right breast and take two circular turns around the body. On reaching the right breast for the second time carry the bandage up over the lower edge of the breast, around the outer portion of the left shoulder, across the upper part of the back, over

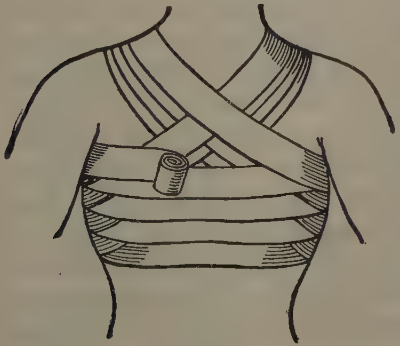


Fig. 78. Bandage for both breasts.

the right shoulder, down obliquely over the front part of the chest and over the lower part of the left breast, around the body, back to the right breast then up to the left shoulder, and so on. Make each turn higher than the preceding one and overlap the circular turns about one-half their width and the shoulder turns about two-thirds.

Capeline or recurrent bandage of the head.—Place the initial end of the bandage on the forehead and hold it in place with the left hand. Take two circular turns around the head and back to the starting point. Then make a right angled reverse, hold it in place with the left hand, and carry the bandage to the back of the head, in the median line, well down on the nape of the neck. Make a right angled reverse, have an assistant, or the patient, if well enough, hold this in place and bring the bandage forward to the forehead, covering about one-third of one side of the first turn across the head, but converging toward the starting point. Reverse again and carry the bandage back across the head on the opposite side of the median turn. Repeat these turns back and forth across the head until the latter is covered. Make each turn lower than the preceding one and overlap it about one half its width. Take two or three circular turns around the head to hold the reverses in place. Pin the last turn to the reverses on the forehead. If the posterior reverses are made low on the neck, the circular turns will usually keep them secure, but if the patient is in bed and restless it is well to sew them.

Fig. 79. Recurrent bandage.

Bandage for the front of the head.—Place the initial end of the bandage on one temple and fix it by two circular turns. Carry the bandage downward behind the ear, around below the occiput, then upward, behind the other ear, over the front of the head, and so on as often as necessary.

Bandage for the side of the head.—Fix the bandage by making two circular turns around the head, on reaching

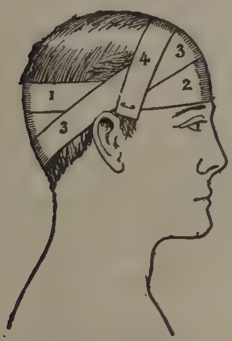


Fig. 80. Bandage for front of face.

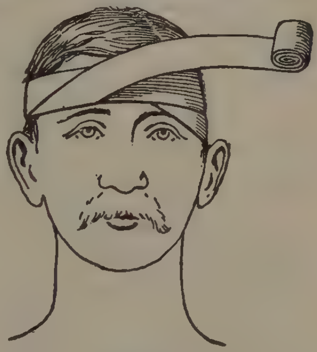


Fig. 81. Bandage for side of head.

the forehead the second time reverse the bandage, have some one hold it in place and pass it, on the side that is to be covered, around to the nape of the neck, overlapping the circular turn half its width, reverse it and hold the reverse in place, pass the bandage back to the forehead, covering one-half of the last turn. Repeat the turns as often as necessary and finish with a circular turn. Pin the end of the bandage to the reverses in front, as in the case of the capeline bandage, if the posterior reverses are made low on the neck they will usually be held in place with the circular turn, but if necessary they can be sewn.

Figure-eight bandage for one eye.—For the right eye place the free end of the bandage in the center of the forehead, make two circular turns around the head just above the ears, carry the bandage across the occiput, pass it on under the left ear, up over the face above the nose and over the lower part of the right eye to the forehead, take a circular turn around the head, higher than the first turns and covering one-half their width. Take another oblique turn around under the occiput and up under the left ear and over the right eye, making it higher than the preceding oblique turn. Repeat the circular and oblique turns as often as necessary to cover the eye, finish with a circular turn. To bandage the left eye proceed in the same manner as for the right, but reverse the direction of the oblique turns, *i. e.*, carry them over the left eye and under the right ear.

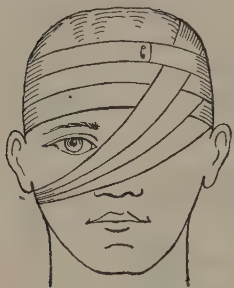


Fig. 82. Figure-eight bandage for one eye.

Figure-eight for both eyes.—Place the initial end of the bandage on the neck below one ear, pass the bandage obliquely across the face and over the lower part of the eye on the opposite side, behind the head and down over the lower part of the other eye, across the face, under the ear on the opposite side, below the occiput to the starting point; repeat these two turns to fix the bandage and then continue making similar turns until the eyes are covered, make each set of turns higher than those

Fig. 83. Figure-eight for both eyes.

of the preceding figure. Finish with a circular turn around the forehead.

Bandage for the ear.—Put a soft cotton pad behind the auricle and in bandaging keep the latter in its normal position. Place the initial end of the bandage on the head above the facial side of the affected ear, carry the bandage down and backward over the front of the ear, below the occiput, up behind the well ear and back to the starting point. Repeat this turn to fix the bandage. On reaching the starting point for the second time take a circular turn around the head and forehead, then repeat the first turn farther back on the ear than the latter, covering two-thirds of its width. Repeat the circular turn and so on until the ear is covered. Finish with a circular turn.

Fig. 84. Ear bandage.

Bandage for the jaw.—Place the initial end of the bandage on top of the head, hold it in place with the thumb of the left hand, carry the bandage around the face in front of the ears and under the chin. Repeat this turn. On reaching the starting point for the second time pass the bandage back of one ear, around the back of the neck, over the chin, around the lower part of the occiput, and up around the back of the

Fig. 85. Bandage for the jaw.

head to the starting point and then around the face and chin as before. Repeat these turns two or three times, covering each preceding turn about two-thirds its width.

Demonstration 95

Binders. Slings. Handkerchief and Tail Bandages

Requisites.—Scultetus and tail binders. Pieces of muslin about one yard square for slings and handkerchief bandages. Safety pins, scissors.

The scultetus or many-tailed binder.—This binder is used on the abdomen both to retain dressings in place and

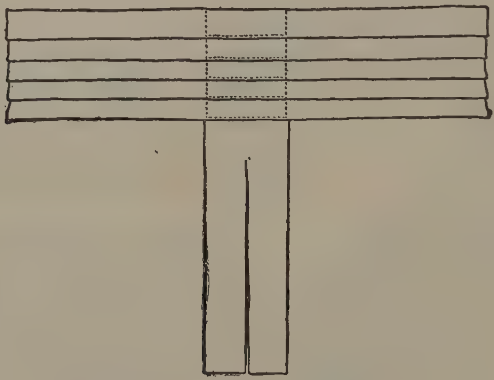


Fig. 86. Scultetus binder with tails.

to afford support. It is also sometimes used, instead of bandaging, to retain dressings in place on the chest. It is made of unbleached muslin or Canton flannel cut in strips about three inches wide and 1¼ to 1½ yards long. Usually five strips are used. They are placed as shown in Fig. 86, each strip overlapping the one under it half its

width. In the center the strips are sewn together for about ¼ of a yard. The binders are made with and without tails. The tails consist of a strip of the material about ¼ of a yard wide and a yard long. This is stitched to the back of the middle of the binder and the free end is split up the middle to within about two inches of the body of the binder. The edges of all the strips are usually overcast to prevent ravelling.

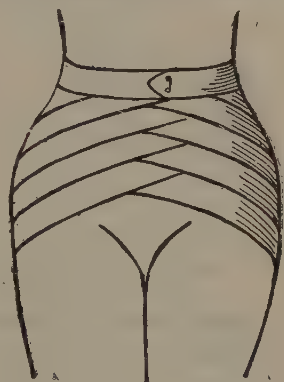


Fig. 87. Scultetus applied.

To apply the scultetus binder pass it under the back and, beginning at the bottom, fold the strips obliquely, alternating from each side, over the abdomen, crossing them in the center. If a binder with tails is used, the latter are brought up between the legs and pinned to the body of the binder. They prevent the binder sliding up. It is very important that the binder be kept smooth under the back and that, unless specially ordered, it should not be applied tightly.

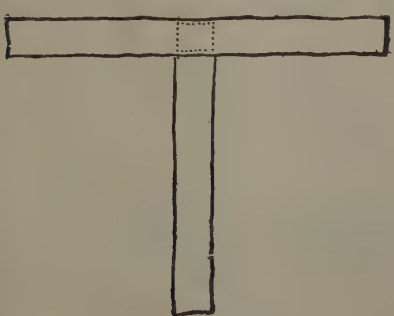


Fig. 88. T-binder.

T-binders.—T-binders consist of hemmed strips of unbleached muslin or Canton flannel fastened together in the form of the letter T. The strips

are usually made about four inches wide and 1 to 1½ yards long. The single T-binder is used for female patients and the double one for males. The binders are used to retain dressings or pads over the rectum or external genitals. The straight strip is put around the waist and the tail brought up between the legs and the ends are then pinned together.

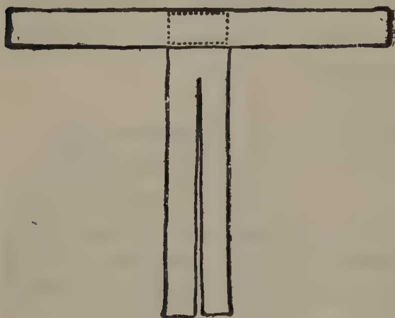


Fig. 89. Double T-binder.

Slings, tail and handkerchief bandages.—The sling illustrated in Fig. 90 and the handkerchief bandages can

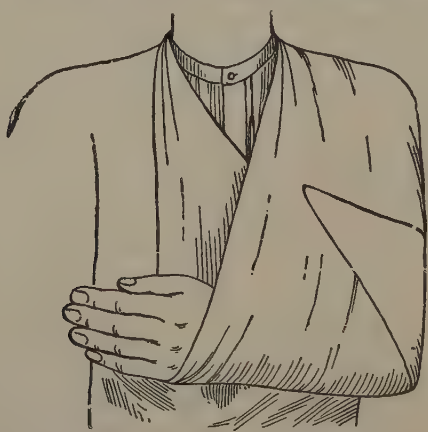


Fig. 90. Sling. The two points are tied at the back of the neck.

be made by folding a large handkerchief or a piece of muslin or other firm material (about three quarters to

one yard square) diagonally, or the material can be cut diagonally. The result is a triangle as shown on Fig. 91.

Fig. 91. Shape of material for sling shown in Fig. 90 and for the handkerchief bandages.

For the cravat sling shown in Fig. 92, either a triangular piece of material with its central point folded in, or a

Fig. 92. Cravat sling.

straight piece can be used. The tail bandages consist of muslin or similar material, long in proportion to their

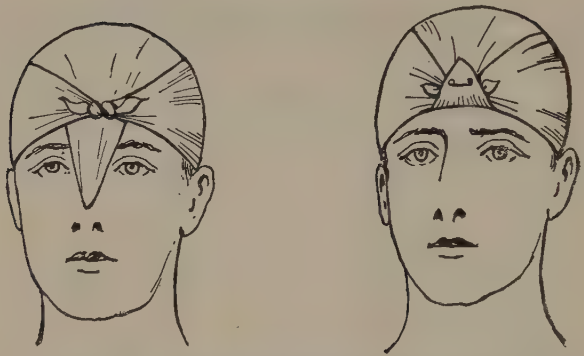


Fig. 93. A handkerchief bandage for the head.

Fig. 94. Handkerchief bandage for the hand.

Fig. 95. Handkerchief bandage for the heel.

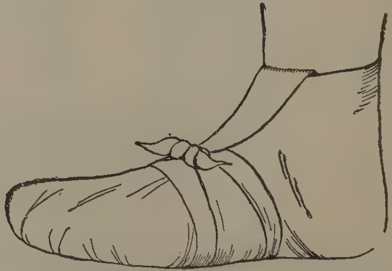


Fig. 96. Handkerchief bandage for the foot.

width (the size depending upon the part to be covered) split at each end. The methods of adjusting these slings

Fig. 97. Four-tailed bandage of the head.

Fig. 98. Tail bandage on back of head.

and bandages can be easily learned by studying and copying the illustrations and, therefore, space will not be taken to describe them.

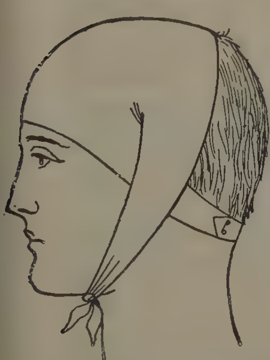


Fig. 99. Tail bandage on forehead.

Fig. 100. Tail bandage for chin.

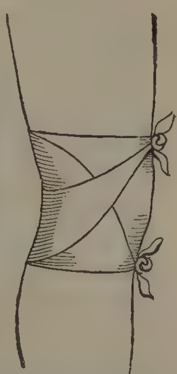


Fig. 101. Four-tail knee bandage.

Demonstration 96

Plaster Cast or Splint

Requisites.—1. Two large rubber sheets, one to protect the bedding and the other the floor. 2. A doctor's apron. 3. An old pair of rubber gloves. 4. Two or four sand-bags. 5. Soft muslin or Canton flannel bandages. 6. Two strips of Canton flannel three inches wide, cut on the bias, and long enough to go around the limb at the ends of the cast—these are called *cuffs*. 7. Plaster bandages. 8. A deep basin containing sufficient water to cover three or four bandages at a time; salt, about one dram, is generally added to the water as it hastens the drying of the plaster.

Procedure.—Expose the part to be bandaged, put a rubber under it, and, unless it is bandaged, wash it with soap and water, dry it thoroughly, and powder it.

Put a rubber on the floor between the table on which the bandages are to be prepared and the bed.

The bandage is applied by the doctor, a nurse is often required to hold the limb in position and another to prepare the bandages.

Either a soft muslin or Canton flannel bandage or a soft cotton stocking (for the leg) is put on first to protect the skin from the rough plaster. A cuff, described with the requisites, is put around the limb above and below the limits to which the cast is to reach.

A few minutes before the doctor is ready for the plaster bandages put two or three bandages into the water. When the bubbles cease to rise the bandages are sufficiently soaked and ready for use. Put more in as required, one should always be ready for use when needed. Before handing a bandage to the doctor squeeze it gently, surrounding its two ends with the hands while doing so,

as this helps to prevent the escape of the plaster, if there are any ravellings on the edges of the bandage remove them. As a rule three or four layers of bandage are applied and, before the last layer is finished, half of each cuff is turned over the edges of the cast and held in place with the final bandage. After the cast is completed, the plaster in the basin is usually rubbed over its surface. A plaster bandage is never applied as tightly as other varieties because the material shrinks as it dries. However, even though this precaution is taken the cast sometimes becomes too tight, especially at its terminations, and therefore symptoms of interference with the circulation must be watched for; these were mentioned on page 571.

When the cast is completed make the patient comfortable. Leave the rubber protecting the bedding in position until the cast is dry, arrange the bed covers neatly, but leave the cast exposed, place one or two (as required) sandbags on each side of the cast so that there will be no danger of its becoming bent. Leave it thus until dry and hard.

To remove a plaster cast.—Moisten it in a straight line, unless otherwise specified down the center. Water can be used for the purpose, but certain liquids, as vinegar, bichlorid of mercury, and peroxid of hydrogen, dissolve the plaster more rapidly and are therefore preferred. When the line is soft, cut along it with a plaster knife. Cut the protecting bandages up the center with bandage-scissors. The cast is not removed until the doctor is present and then following his instructions.

Demonstration 97

Strapping

Requisites.—Rolls of adhesive plaster 8 inches, 2 inches, 1½ inches and 1 inch wide. Scissors.

Strapping so-called, consists in the application of straps of adhesive plaster in a manner to support and partially immobilize the part to which they are applied. The parts most commonly so treated are: (1) the chest, in fracture of the ribs and pleurisy (in the latter case it is used to restrict the breathing movements and thus lessen pain); (2) joints, especially the wrist, knee, and ankle.

To strap the chest.—Shave the part if there is hair on it. Wash it with alcohol and dry it thoroughly (*sebaceous matter and moisture on the skin inhibit the ready adhesion of the plaster*). The strapping is applied in different ways. According to one method a piece of adhesive plaster long enough to extend from the far side of the spine[1] to that of the sternum and wide enough to cover from under the breasts to the lower margin of the ribs is used; according to another, pieces of adhesive plaster of the length just mentioned and two inches wide are used; these are stuck one to another, overlapping one half the width of the strip until a band the width previously described is made; a third method consists in cutting strips of 2 inch adhesive the same length as for the other methods, the number will depend upon the size of the patient, usually 5 to 7 are required, and applying each strip

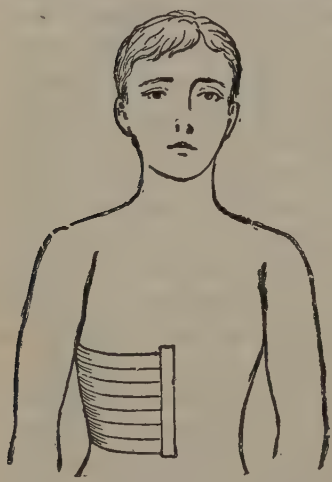


Fig. 102. Strapping of the chest.

[1] When measuring the adhesive place the non-adhesive side next the skin.

separately as described later. To apply the strips when prepared by either of the two first methods place one end of the band on the spine, make the patient take a long breath and then "let out the breath" and, while the chest is comparatively contracted, quickly stretch the plaster and fix its free end over the far margin of the sternum. Mold it to the body with the palm of the hand until all wrinkles are removed. To prevent the ends curling put a narrow strip of adhesive plaster down both the back and front. To apply the single strips, proceed in the same manner as for the single band, but apply each strip separately and make the patient take a long breath and then "let out the breath" before each application. Put the lowest strip on first. Overlap each strip one half its width.

To strap the wrist.—Cover the back and sides of the joint with one inch wide strips of adhesive plaster. Stretch the strips while applying them so that they will fit somewhat snugly, overlap each one about half its width, put a strip down each end to prevent it curling.

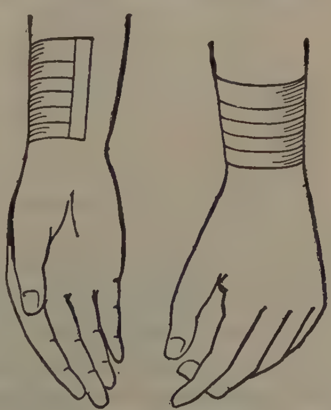


Fig. 103. Strapping of the wrist.

To strap the knee.—Method 1. Cut four pieces of one-inch adhesive plaster long enough to reach, when tightly stretched, from the middle of the leg just above the patella to the side of the latter. Cut twelve more strips, four of them one-half inch, four an inch, and four an inch and a half longer than the first ones. Prepare the

skin as described for strapping the chest. Surround the kneecap with the smallest strips, stretching them tightly, and crossing them in the center both above and below the patella and at the sides. Apply the next size strips in

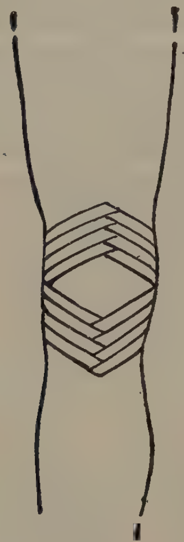


Fig. 104.

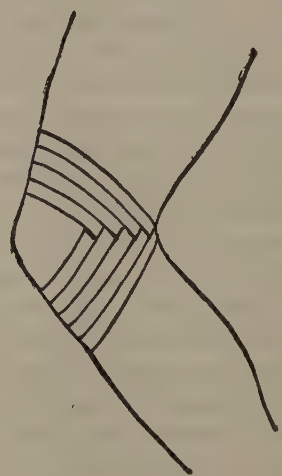


Fig. 105.

Strapping of the knee.

the same manner, above and below the first, overlapping the former half their width, and so on. The strapping must be applied firmly and without wrinkles. Cover the knee with a firm knee bandage. Method 2. Cover the knee and about two inches above and below it with strips of adhesive in the same manner as the wrist.

To strap the ankle.—Prepare the skin as described under strapping the chest. Place the heel on a stool, put a bandage back of the toes and have the patient hold the

ends so that his foot will be drawn forward. Stretch a piece of 1½ inch adhesive plaster down one side of the leg from about three inches above the ankle, crossing the point of injury. Pass it under the sole of the foot, well toward the front, and up the other side of the leg the same distance.[1] Use one inch wide adhesive plaster for the other strips. Stretch one piece down one side of the leg near the back, beginning about six inches above the ankle, carry it under the heel and up the other side of the leg an equal distance. Place the center of a strip at the back of the heel, near the sole, bring one end of the strip around the foot, almost to the small toe, and the other around on the opposite side toward the big toe. Put on alternate strips in this manner, working toward the front of the foot for the vertical strips and upward for the horizontal and covering each strip about half its width. Finish by putting a straight strip down each side to prevent the ends curling.

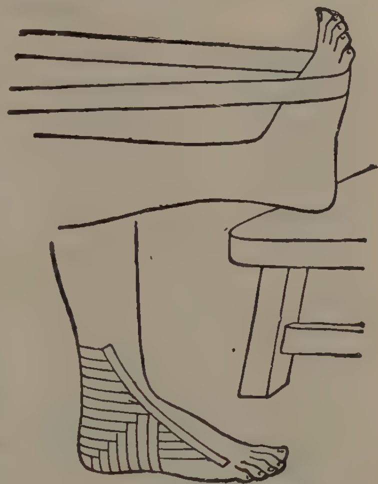


Fig. 106. Strapping of the ankle.

It will be noticed that the adhesive plaster is never put entirely around a part. This is because there is so little "give" to adhesive plaster that, were the part

[1] This strip is to help hold the foot in position, it is under the other strips and thus does not show in Fig. 106

encircled when the plaster is applied tightly enough for support the circulation would be interfered with.

Demonstration 98

Splints

Requisites.—1. Different types of splints. 2. Cotton wadding. 3. Non-absorbent cotton. 4. Gauze and muslin bandages. 5. One inch adhesive plaster. 6. Scissors.

Purpose.—Splints are used to immobilize or to give support to injured or diseased parts of the body.

Material used.—In emergency any material that is sufficiently stiff not to bend can be used as a splint, *e. g.*, umbrellas, canes, several thicknesses of stiff cardboard, etc. Regular splints are made of wood, plaster, tin, and there are several special varieties made of leather and steel or other metal. Plaster splints or casts have been already described. Wooden splints are of two types: (1) basswood, (2) stiff splints made usually, because of the relative cheapness of the wood, of pine. Basswood can be cut very thin and is then pliable and can thus be fitted to a part; however, it is not firm enough to give much support and, except for small parts, as a finger, it is used chiefly in connection with other splints, especially plaster, and extensions, and when only a slight degree of immobilization is required. What are known as *coaptation splints*, which are sometimes put around a fractured part before the application of a plaster bandage, are made of small strips of basswood held together with strips of adhesive plaster. A splint intended to support a fractured part is usually wanted about ¼ inch thick, long enough to extend slightly beyond the joint above and below the point of injury, and slightly broader than the part to which it is to be applied.

Essential care in the use of splints and braces.—The nature of the various types of splints and braces, and the methods of applying them, can be so much more easily learned by observation than description that space will not be taken for the purpose further than to call attention to certain essentials in the care of patients using any type of such appliances. (1) Unless the part to which a splint is to be applied is entirely covered with a thick dressing, the splint is to be well padded, especially at the ends. This is also necessary with parts of a brace that come in contact with the skin if these are not supplied with soft cushions. (2) When a splint is removed temporarily, wash the part, if there is a wound it may be only possible to do this with alcohol, but if possible use soap and warm water first, dry the part thoroughly, rubbing it well to excite the circulation, and powder it. (3) Fasten splints and braces sufficiently securely to keep them from moving and causing irritation, but never tightly enough to impede the circulation—it is to be appreciated that, when the use of such appliances is necessary, free circulation in the part is particularly important in order to overcome the abnormal conditions. (4) Always be on the watch for (a) pressure sores, these are particularly likely to occur near the edges of a splint; (b) interference with the circulation; even when a splint is properly applied the bandage may become too tight if there is inflammation because of increased swelling of the part. Symptoms are: coldness, swelling, a red or bluish discoloration, tingling, pain, or numbness, in the part at the distal end of the splint.

Traction and Suspension

Fractures of the femur and humerus are now generally treated by traction, *i. e.*, the fractured limb is subjected

to a pull which keeps the lower fragment from overlapping the upper one and keeps the muscles of the limb stretched thus providing an external pressure around the fractured part which keeps the broken ends in apposition, also it prevents the muscles contracting and thereby pulling the lower fragment out of place, which they tend to do when they are not kept stretched, even when, according to the older method of treatment, the part is encased in a plaster cast.

In what is known as the Buck's extension, which was one of the first types of traction used for fractures of the femur, the traction was made on the leg, but in the newer types the traction is applied to the lower part of the thigh, except when the fracture is at the lower end of the femur or when there are wounds that render this impossible. One advantage of the new method is that the knee joint is not immobilized and thus does not become stiffened, as very commonly happens when the Buck's extension or a plaster cast is used. A special splint (the Jones' splint) is sometimes used to secure extension when there is fracture of the humerus and a splint, such as the Hodgen or Thomas splint, is used in connection with other extension apparatus for fracture of the femur, but these splints do not encompass and confine the limb.

With the newer types of extension the limb is suspended and the traction weights so placed that the traction is removed to the furthest distance possible from the site of fracture. By this means the traction on the muscles on both sides of the limb, and consequently around the bone, is equalized and this method has been found to prevent overlapping of the fragments of the fractured bone better than any other, moreover, when the limb is suspended, a much greater degree of motion, not only of the joints of the affected limb, but of the whole

body, is possible than could be permitted with the appliances formerly used without danger of disturbing the fractured ends. Therefore this type of treatment has several advantages over the older types, viz., relatively free movement is possible and therefore the patient is more comfortable, the circulation in the limb and other parts of the body is less interfered with and thus relatively rapid union of the fracture is favored, the normal condition of the muscles and joints is conserved, and there is less danger of the development of bed-sores. Also, if there is a wound it can be dressed without disturbing the extension apparatus.

In order to get good results the traction must be made and maintained in such a manner that the broken fragments are kept in normal apposition and therefore the nurses must see that the pulleys and weights remain in the position arranged by the surgeon.

Requisites for traction and suspension.—The framework for suspension; ropes, trolley, pulleys, weights, blocks or other appliance for raising the foot of the bed; the appliance for securing the traction apparatus to the limb, this varies, one type is shown in Fig. 110, sometimes moleskin is used and the buckles are then attached as shown in Fig. 110; if moleskin is used an alcohol lamp will be needed to heat the former in order to make it adhere to the skin, muslin bands are sometimes glued to the skin; a splint; and for the leg, if the splint is not provided with a foot rest; or something, see Fig. 112, that will answer the purpose; for suspension of the humerus, slings, as shown in Fig. 111.

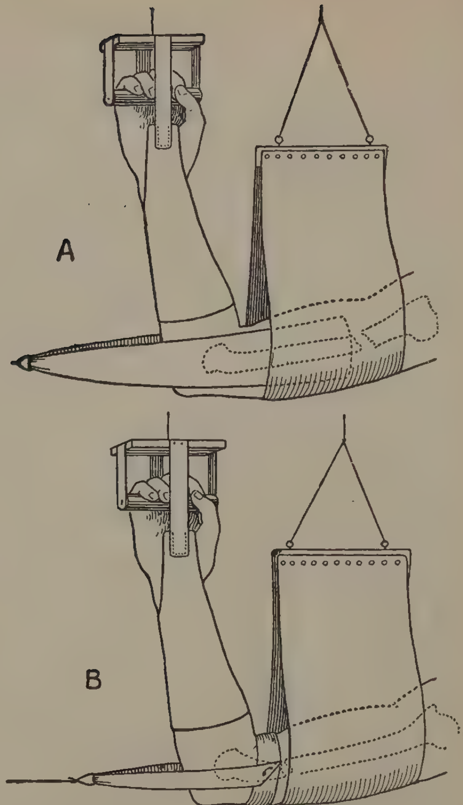


Fig. 107. Suspension and extension in fractures of the forearm.

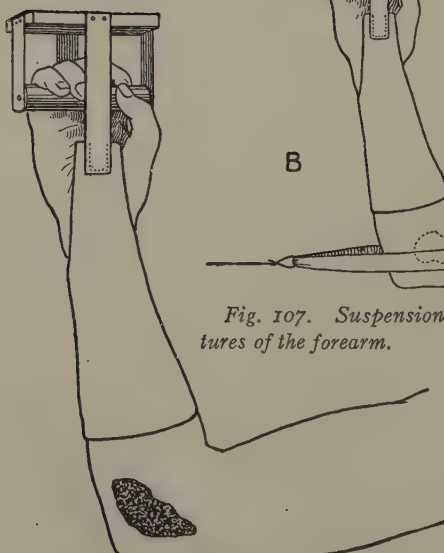


Fig. 108. Suspension of the forearm in a compound wound of the elbow joint.

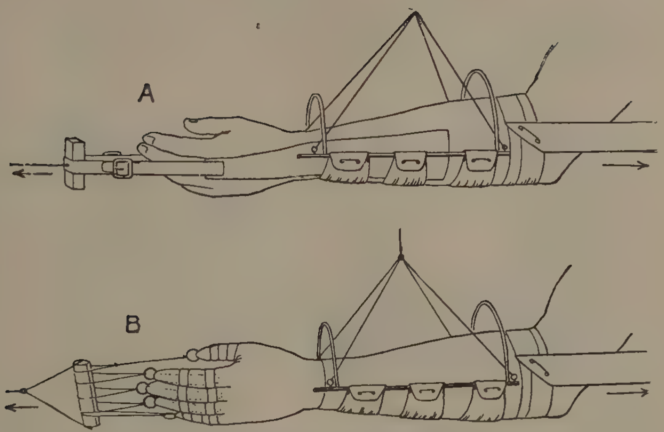


Fig. 109. Cradle used for fractures of the forearm.

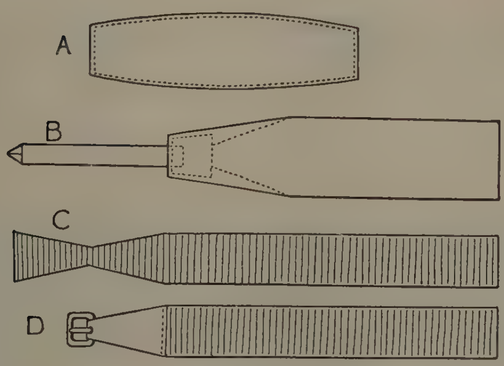


Fig. 110. Bands to support limb in a Hodgen's or Buck's splint

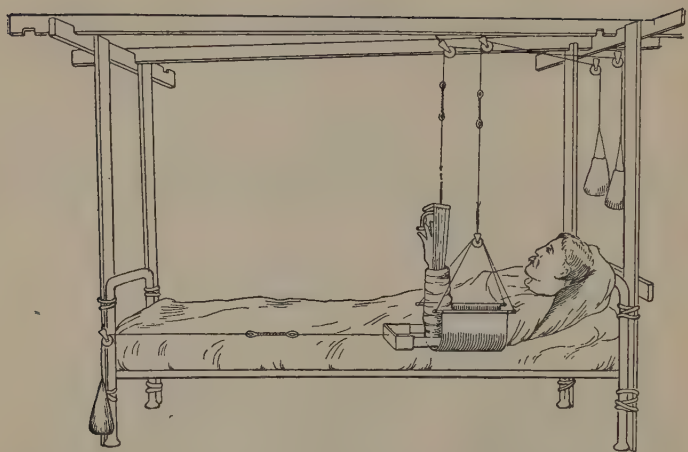


Fig. 111. Suspension and extension for fractures of upper extremity

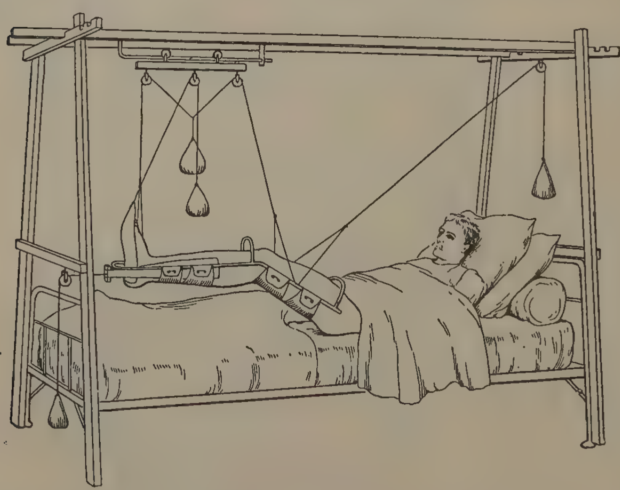


Fig. 112. Method of suspension for fractures of the lower extremity.

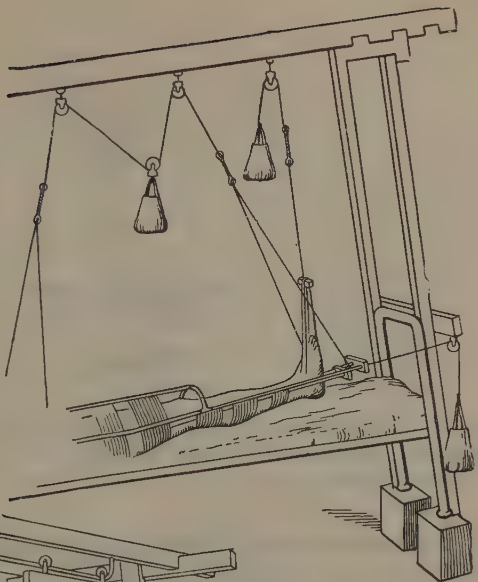


Fig. 113. Suspension and extension for fractures of lower extremity.

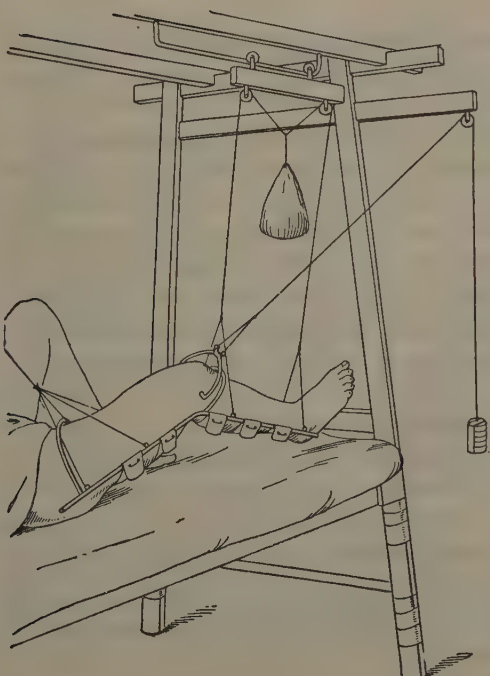


Fig. 114. Showing the arrangement for fracture of the upper third of femur.

Figs. 107 to 114 inclusive are taken from the December number of *Progressive Medicine* (1919) with the permission of the publishers, Lea & Febiger.

CHAPTER XX

Wounds

The classification, means of repair, and common complications of wounds. Methods of dressing wounds. The Carrel-Dakin treatment of wounds.

A wound is usually defined as *any solution or break in the continuity of body tissue caused by violence or intentional cutting.*

According to their nature wounds are classified as:

1. Incised wounds, *i. e.*, those in which the edges are clean cut and there is no tearing of the tissues. Such wounds are made with a sharp instrument as a knife.

2. Contused wounds, *i. e.*, those associated with contusion[1] or bruising of the tissues. The edges of such wounds are usually crushed and jagged. A wound of this kind is generally made by a blow from a heavy object or a fall.

3. Lacerated wounds; in these the edges are torn and mangled. These are the kind of wounds likely to be produced in accidents caused by machinery.

4. Punctured wounds; in these the wound is deep in proportion to its diameter and it has but a small opening.

[1] A contusion is a wound, associated with rupture of blood-vessels, beneath the skin. The discoloration is due to the extravasation of blood into the tissues.

Such wounds are produced by pointed objects as nails, daggers, etc., and, sometimes, by bullets.

Wounds are also classified according to their origin (*e. g.*, operative wounds, gunshot wounds, etc.) and depending upon their freedom from, or contamination with, bacteria, as aseptic and infected wounds.

Aseptic wounds are defined as *wounds which are sufficiently free from microörganisms to show no symptoms of infection*, and **infected wounds** as *wounds which are invaded by organisms sufficient in number and virulence to produce pathological symptoms.*

Allied to wounds, though not usually classified as such, are the open sores such as ulcers, pressure sores, etc.

Healing of Wounds

Four processes by which the body endeavors to repair wounds in its tissues are: (1) The inhibition of infection; (2) the disintegration and removal of débris such as blood clots and devitiated cells; (3) the proliferation of new cells to replace those destroyed; and (4) when possible, the sealing together of the walls of the wound.

The primary factors upon which these processes depend result from the injury. They are: (1) The stimulation of the reproductive faculty of the cells and (2) the dilatation of small blood-vessels in the area. As the result of the dilatation, the blood-vessels become congested and there is increased exudation of liquid from the blood and diapedesis of white corpuscles into the surrounding tissues. The leucocytes disintegrate blood-clots and devitiated tissue cells and thus prepare them for absorption and removal by the blood, and the wound is thereby cleared of the débris occasioned by the injury; also the leucocytes destroy bacteria and may thus prevent infec-

tion of the wound. The liquid exuding from the congested vessels, providing the congestion is not so extreme or prolonged that the circulation in the area is inhibited, provides extra nourishment for the cells, which favors their proliferation, also, being of a glutinous nature, it helps to hold the walls of a wound together if they are brought into juxtaposition soon after being severed.

Processes involved in the formation of new tissue.—New tissue is produced in the same manner as tissue arises originally, viz., by cell proliferation; there is, however, considerable variation in the degree of restoration that the cells of different tissues are capable of; connective tissue cells, the cells of the blood-vessel walls, and those of the skin retain the power of proliferating throughout life, but the cells of the more highly specialized tissues, such as muscle, glandular, and nervous, lose the power of reproduction early in life. Though destroyed nerve-cells cannot be replaced, the nerve-fibers extending between the central nervous system and the periphery may be, if the injured portion is sutured to the portion connecting with the cell-bodies (*which are responsible for the nutrition and growth of the fibers*). The severed portion does not recuperate, but gradually disintegrates, but the suturing is necessary to keep a path open for the new growth.

When a wound is made in muscle tissue the cells of the areolar connective tissue, which, it will be remembered, permeates all muscle, as well as other parts of the body, proliferate readily as do also those of the skin and blood-vessels. The cells of the walls of injured blood-vessels form small loops of capillaries which project from the parent vessels and thus the new connective tissue and epithelial cells are provided with nourishment as they grow out from the walls of the wound. Chiefly because of the

manner in which the new capillaries form, an open wound assumes a rough granular appearance and, for this reason, the new tissue is spoken of as *granulating tissue* or *granulations*.

At first, the new connective tissue cells are soft and oval-shaped, but they gradually contract and harden to a varying degree and the contraction, by the pressure it produces on the newly formed capillaries, causes their obliteration; thus, the new tissue becomes more or less dense, inelastic, and anemic and is known as *scar* or *cicatricial tissue*.

The amount and density of scar tissue and the rate of wound repair depend chiefly upon the following factors:

1. The nature of the wound. Naturally, an aseptic, incised wound will heal more rapidly than one in which the edges are torn or contused or in which the tissue is disintegrated by suppurative processes.

2. How soon the walls of the wound are brought into apposition. Immediately following injury the conditions are more favorable for agglutination than later, and the more firmly the walls adhere, the less the amount of new tissue required.

3. The age of the individual. In youth, while tissue growth is still in progress, a wound will, other conditions being equal, heal more rapidly than in adult life and there is always a chance of the reproduction of some muscle cells and of the connective tissue remaining relatively pliable.

4. The vitality of the part. Healing occurs but slowly when the area surrounding the wound is devitalized by bruising, or the circulation in the part is interfered with in any way, and when the individual is the victim of a condition that interferes with nutrition, *e. g.*, diabetes, anemia, arteriosclerosis.

The after effects of an injury are largely determined by the amount of new tissue that has to be formed, for, it can be readily appreciated, if much of the soft, contractile, elastic muscle tissue is replaced by dense, inelastic fibrous tissue, the functioning of a part is likely to be seriously interfered with.

Methods of healing.—The healing processes in all kinds of wounds in soft tissues are practically the same, the only differences being (1) whether or no agglutination (*sticking together*) of the walls can occur; (2) the amount of new tissue required. According to these differences wounds are said to heal by (1) *first intention* or *primary union* or *apposition* or *per prinum;* (2) *granulation* and according to the amount of granulating tissue necessary to fill in a wound, it is said to heal by *second intention* or, when the wound is deep and a large amount of granulating tissue is necessary to fill it, *third intention.*

Healing by primary intention.—If the sides of a clean wound are brought together shortly after they have been severed, agglutination will occur and there will be very little new tissue required so that by about the fourth day after the wound was made the preliminary stages of healing will be completed, though the new tissue will be soft and easily torn, but by the end of from ten to twenty-one days according to the size of the wound and other factors just mentioned, the tissue should, normally, be relatively strong. The new skin along the line of incision *i. e.*, the scar, will be red for some time longer but the skin surrounding it should be of normal color. Later, due to the contraction of cells already referred to, which drives much of the blood from the new tissue, the scar fades until it is whiter than the surrounding tissue.

Causes of pain.—Usually, a few hours after a clean incised wound is sutured pain ceases if the part is kept

at rest and the dressing has been properly applied, for pain in a wound is due to stimulation of nerve endings, and in a clean-cut wound, this stimulation soon ceases if conditions are normal. If pain does occur it is nearly always due either to (1) muscular movement which pulls upon the sutures; (2) pressure due to too tight splints or bandages, or the collection of exudates in the wound, or (3) infection.

Causes of rise of temperature.—Shortly after an extensive wound has been made, either intentionally or by accident, there may be a slight rise of temperature, but, unless there are complications, this will subside in a few hours; such a rise of temperature is usually referred to as *traumatic fever* and it is not considered of any importance. If, however, the temperature rises three or four days later, infection is suspected.

Healing by granulation.—When for any reason a wound cannot be closed and in injuries, such as burns and deep ulcerations of any kind, in which there is destruction of the superficial tissues the denuded space must be filled in with new tissue as already described and, because of the rough granular appearance which this tissue assumes during growth, healing, as previously stated, is said to take place *by granulation*.

The small elevations of the surface of a wound which cause its granular appearance consist of the capillary sprouts surrounded by the new connective tissue cells. The cells of the individual granulations elongate and come into apposition with the cells of other granulations and, by division, form new cells and thus even a deep wound will, normally, soon be filled in. While this process is going on new epithelial cells arise from the skin surrounding the wound, but, as their growth does not keep pace with that of the connective tissue cells, it is

often necessary, if there is a large area to be covered to graft[1] skin over the denuded surface.

Appearance of granulating wounds.—The granulating surface of a wound that is proceeding normally is bathed with a thin pus and the granulations are about the same color as muscle tissue but sometimes, especially when the circulation in the part is not normal or the person's health is below par, the granulations become pale and small and the surface of the wound may be either drier than is natural or the secretion may become thick and tenacious. On the other hand, if granulations are irritated by such things as retained sutures, improperly applied dressings and the like, and when the epithelial cells do not cover the granulations as they reach the surface of the wound, the granulations are likely to grow exuberantly and become soft and large and bleed easily.

Infection of Wounds

Bacteria are present in the pus of a normal granulating wound, in fact, not even wounds that heal by first intention are absolutely sterile, but the organisms are not of a type or present in sufficient number to cause trouble. If a wound becomes infected with a sufficient number of pyogenic bacteria the symptoms of inflammation—viz., redness, swelling, pain, and heat—will occur. These symptoms result from the increased amount of blood that

[1] This consists, after the superficial granulations have been curetted in order to stimulate cell proliferation, in spreading small thin films of skin, taken under aseptic conditions from other parts of the body, like little islands, at small intervals over the denuded surface. New cells arise from these transplanted films and thus the part gradually becomes covered.

collects in the part and this is due to the same causes that promote congestion when the tissue is wounded, the irritation promoting them in the latter case being the poisons produced by the bacteria. The increased amount of blood in the part, as stated on page 607 is nature's way of defending the body, for the opsonins and other anti-bacterial substances lessen the vitality of the bacteria and thus prepare them for ingestion by those white corpuscles known (because of their supposed manner of demolishing bacteria, etc.) as phagocytes.[1] If the phagocytes can overcome the bacteria the inflammatory products will be disintegrated by ferments, produced chiefly by the phagocytes, and absorbed. This is known as *resolution*. If, however, the bacteria win there will be great destruction of phagocytes and of tissue, for bacteria produce ferments which cause the disintegration of living tissue and the substance known as pus will be formed. This condition is known as *suppuration*. **Pus consists of** bacteria and their toxins, disintegrated phagocytes, and decomposed inflammatory products and tissue. If a cavity is formed by the disintegration of tissue and retains the pus formed in the process it is known as an *abscess*. If the infection spreads through the subcutaneous cellular tissue, it is known as *cellulitis*. Unless pus can drain freely from a part where it is formed some constitutional symptoms will occur because the toxins produced by the bacteria, the toxic matter re-

[1] From a Greek word meaning *to eat*. Phagocytes, like the one-celled aquatic animal known as the *ameba*, undergo change of shape consisting of alternate protrusions from its surface and contraction, by means of which they can move, even through the walls of the capillaries, and enclose bacteria and other foreign particles with which they come in contact. Also, by virtue of ferments which they secrete, it is thought, they digest the substances they take up in this manner.

sulting from the disintegration of cells, and, sometimes even the bacteria will be absorbed.[1]

The organisms that most frequently cause infections in wounds are: The staphylococci pyogenes[2] albus,[3] the staphylococci pyogenes aurus,[4] the bacilli pyocyaneus,[5] the bacilli coli communis, the streptococci pyogenes, and the streptococci erysipelatis.

Both varieties of staphylococci, but especially the albus, are constantly present on the skin and in the mouth and, sometimes, in the intestines; thus they are very common causes of infection. The albus is the lea virulent. The bacilli pyocyaneus is quite frequently found on the skin and in the intestines. The bacilli coli communis, of which there are many types, are, as their name implies constantly present in the intestines and they are thus a common cause of infection of wounds made with anything that has been soiled with feçal matter and of peritonitis following perforation of the intestines. The pyogenic streptococci are not quite as generally found as the other varieties of pyogenic bacteria, but the infections they cause are much more serious.

Another, though less, common infection of wounds, is that due to the **bacilli aërogenes capsulatus or gas-producing bacteria.** These bacilli are often present in the intestines of even healthy animals and humans and in

[1] Poisoning due to absorption of toxins by the blood is known as *toxemia;* that due to the presence of bacteria in the blood, as well as their toxic products, is termed *septicemia* and, when the septicemia is complicated by the frequent formation of abscesses in different parts of the body it is known as *pyemia;* a toxemia due to the absorption of the products of putrefactive bacteria on body tissue and exudates is known as *sapremia.*

[2] Pus producing. [3] White. [4] Gold.

[5] Green pus. These bacteria were so-called from the color of the pus characteristic of infections produced by them.

soil and water, but, fortunately, they do not easily thrive in wounds for, when they do, very serious conditions are produced because they disintegrate the material upon which they live and in the process produce such large quantities of gas that pressure enough may result to shut off the supply of blood to the part and gangrene be caused, and, largely from the absorption of the poisonous products of this necrosis, death.

The bacilli tetani are common inhabitants of the intestines of cattle and horses, and thus deep wounds, made by implements used in stables or into which soil that has become mixed with manure is driven, are likely to become infected with this organism. Though the bacilli remain in the wound, they do not cause any very great disturbance there, but the toxins they elaborate are absorbed by the blood and, as they have a strong affinity for nerve cells, they combine with certain ones and convulsions result and, usually, death, unless remedial measures are taken early.

Complications of Wounds

Especially when wounds are received accidentally they are likely to be complicated by: Shock; hemorrhage; injury of special structures as bones, nerves, tendons; the presence of infecting matter; and these conditions have to be considered before the wound is dressed.

The supposed causes of shock and its symptoms are mentioned in Chapter VIII. and its treatment in Chapters XXI. and XXIII.

The severity of a hemorrhage will depend, as a rule, upon the size of the blood-vessels injured and the nature of the wound; a clean-cut wound, such as is made with a

sharp knife, is likely to bleed more freely than a contused or lacerated one, since the conditions existing in these varieties tend to occlude the severed ends of vessels and favor clotting. The means used to check hemorrhage are described in Chapter XXIII., and the symptoms in Chapter VIII.

Though a hemorrhage is to be controlled as soon as possible, bleeding that is not severe nor uncontrollable enough to be so designated should not be checked unless it persists for a considerable time, because there is no better method of cleaning out a wound. In fact, in some cases, it is well to place the part in a position to encourage bleeding.

Because of the possibility of injury to unseen structures, the danger of infection and the advisability of having the wound sutured as soon as possible, a surgeon should be consulted when a deep wound is received.

Treatment of Wounds

Important fundamental principles involved in the treatment of wounds are as follows:

1. Nothing unsterile is allowed to come in contact with a wound, even a wound that is already infected.
2. Endeavor is made to disinfect an infected wound.
3. All foreign substances, as dirt, blood-clots, devitalized tissue are removed from a wound as soon as possible, for they increase the possibility of infection and prevent healing.
4. Free drainage for exudates (even blood serum) and pus is provided when these are present.
5. The physiological conditions by which the body endeavors to repair injury to its tissues (and upon which healing depends) are taken advantage of and encouraged

and thus the sides of a wound are brought into apposition as soon after injury as possible, and interference with the circulation, as by tightly applied bandages, is forbidden. Partly for this reason, when it is wanted to hold the sides of a wound together, adhesive plaster is put across it, over the dressing, in preference to enveloping the part in a *tight* bandage.

6. The wounded parts are kept at rest. This is necessary to: prevent pain; keep the sutured parts together; and, in the case of an infected wound, prevent the absorption of infective matter. It will be remembered that this is absorbed chiefly by the lymph vessels, and muscular movement accelerates absorption and also the passage of the lymph toward the ducts from which it enters the blood, thus giving the phagocytes in the lymph vessels and nodes less time to destroy the contained bacteria and, by increasing the amount of virus entering the blood at a time, giving the protective agents of the latter less chance to overcome the infection.

7. Means are taken to avoid irritation of the wound by dressings. The means employed may be the use of something that will prevent the gauze sticking to the wound, or the omission of a dressing, as when the injured part is kept in a continuous bath of either water or hot air. Treatment of this kind is particularly likely to be used when large areas are denuded of skin, because innumerable nerve endings are then exposed and movement of dressings, even change in the surrounding temperature, will stimulate these and excruciating pain may be caused.

The ordinary treatment of the different kinds of wounds is about as follows:

If a wound is the result of an accident, the skin surrounding it is cleansed and disinfected in the same way as the skin is prepared for an incision. An important

point to remember when doing this is to wash away from the wound.

A clean incised wound is, if necessary, irrigated with normal salt solution or a mild antiseptic[1] to remove blood-clots. If the wound is deep or there is likely to be much exudation from the capillaries a small drain[2] is generally inserted in its lower end. If the wound is the result of an accident, it is a common practice to paint it and the surrounding skin with iodine, three per cent. The walls of the wound are then brought into apposition with sutures, a dressing of sterile gauze is applied, and, if there is likely to be any strain on the stitches or movement of the dressing, strips of adhesive plaster are put across the wound over the gauze. A bandage or binder is put on.

Such a wound is not, as a rule, dressed until time to take out the stitches. This is usually done about the eighth or tenth day. If a drain has been put in, the gauze over it is raised about the second or fourth day

[1] Space will not permit of discussion of the antiseptics here and the pupils are referred to the *Handbook of Antiseptics*, Dakin and Dunham, the Macmillan Company. This small book should be in the library of every School of Nursing.

[2] Substitutes used for drains are: Strands of silk or catgut; wicking; strips of gauze with the raw edges turned in; strips of rubber tissue or rubber dam; glass tubes; rubber tubing. A so-called *cigarette drain* is made of a strip of gauze from which ravelings have been removed, surrounded, except for about one-half inch at the end which is to be inserted in the wound, with rubber dam or rubber tissue. What is known as a *dressed drain* is rubber tubing, with one or more holes in the side, wrapped in gauze and, over this, rubber tissue. When drains are put in a deep wound, the number used should be noted on the patient's chart to avoid danger of any being left in the wound should they slip down.

Drains act as such chiefly by capillary attraction. If this is not understood, see pages 75 and 76, *Physics and Chemistry for Nurses*, Pope, G. P. Putnam's Sons, or other textbook of Physics.

and the drain removed, but the dressing otherwise is not touched, unless there are indications of abnormal conditions. After the stitches are out some surgeons paint the surface with iodine before putting on another dressing. A light dressing of gauze is usually kept over the wound until the scar is firm as the new skin is easily abraided.

If a wound has been made with a dirty object or soil of any kind has been driven into it the irrigation must be very thorough for it is imperative that all foreign substance be removed. If such a wound is of the nature of a puncture, the surgeon will probably make an incision so as to allow of proper irrigation and drainage. It is a common practice to paint such wounds with iodine. Unless there is special reason to fear infection, the wound will probably be sutured, but free drainage will be provided for. The rest of the treatment will then be the same as for the first type of wound, but the symptoms of infection must be watched for. If the dirt in the wound consists of soil from around stables or that which has been manured a dose of tetanus antitoxin is given if possible.

When a wound is associated with such severe injury that the tissue of the area is devitalized as much of this as possible is removed and the cleaning of the wound and surrounding skin is very thorough for the resistant power of such a wound to infection will be lowered. The loss of tissue will prevent the suturing of the wound, but after the dressing is applied, adhesive straps will probably be put across it, if it is at all deep, both to lessen tension and to keep the sides of the wound as nearly as possible in their normal position. The nature of the dressing and the subsequent treatment of such wounds vary considerably. Some common dressings are as follows:

1. The wound is sprayed[1] with a 5% to 8% solution of dichloramine-T—[2] the solvents most commonly used are eucalyptol and paraffin—and the wound is then loosely filled with fluffed[3] gauze. This solution is an antiseptic, also it prevents the gauze sticking to the wound, it aids in loosening necrotic tissue, and it stimulates granulation.

2. The spraying is omitted and the wound is filled loosely with fluffed gauze either dry[4] or wet with an antiseptic or drug that will stimulate granulation.

3. There is no dressing put on the wound but the latter is covered with a sterilized cap[5] made of wire netting, and sterile gauze is bandaged over this. The cap must be large enough to extend an inch or more beyond the edges of the wound. The skin is protected from the metal by placing sterile gauze or cotton under the edge of the cap and the cap is secured in place with adhesive strips.

4. No dressing is applied but the part is covered with a bed-cradle in which an electric light is suspended as described in Chapter IX. and the cradle is enveloped with a sterile sheet or sterile towels.

[1] Atomizers or syringes of metal should not be used for this purpose for the solution corrodes metal.

[2] Such solutions must be kept in amber glass bottles for direct light causes their rapid decomposition. Blue glass affords no protection.

[3] When fluffed, gauze will absorb secretions much better than when it is folded.

[4] Dry gauze is not now generally used for dressings if it is found to adhere so firmly to the wound that it is not easily removed by moistening. This is especially the case with injuries such as burns and pressure sores.

[5] A cap can be improvised by bending wire into shape, in fact one can be made from anything that can be sterilized and is stiff enough to stand away from the wound.

5. Whatever the dressing used it is removed daily and the wound exposed to the sunlight.

When granulated wounds are dressed they are usually irrigated; if the wound is a large one the solution should be put in an irrigator; if the wound is small, especially if it is superficial, the solution is put in a sterile dressing basin and sprayed over the wound with a syringe. If the granulations are small and anemic, a tissue stimulant is usually prescribed, and if the granulations are exuberant, a caustic, such as silver nitrate, or the granulations are removed by cutting, for abnormal granulations are conducive to the formation of troublesome cicatrices. It is wounds of this type that nurses most frequently dress and therefore they should make a special point of noting the character of granulations and learn to recognize early signs of abnormal conditions.

Burns, ulcers, and the like are near akin, in their nature, and in the treatment they receive, to granulating wounds. The first-aid treatment for a burn is described in Chapter XXIII. The later treatment varies.

Extensive burns are often treated by keeping the part in either an antiseptic or a hot-air bath or by covering the burn with a paraffin preparation, *e. g.*, ambrine. Before applying the latter, the wound is irrigated with an antiseptic solution and thoroughly dried either with an electric drier or by patting it gently with sterile cotton. The ambrine, after being melted and cooled sufficiently, is sprayed, or applied with a brush, over the wound and about an inch of the surrounding skin. When it is solid it is usually covered with a thin layer of cotton and another coat of ambrine applied. A gauze dressing is bandaged over this. The paraffin cast is lifted from the burn and the dressing done as just described daily. Dichloramine-T, applied as described (page 620), is an-

other commonly used dressing, also sterile ointments spread *thickly* on gauze compresses, and picric acid, either in solution or ointment. Enough paraffin, ointment, etc., must be used to prevent a dressing sticking to a burn and, if this is extensive, it should be so applied that it can be removed in sections to avoid uncovering a large area at a time, which allows of the stimulation of a large number of exposed nerve-endings and thereby causes great pain and increases the danger of shock.

Pressure sores and ulcers also are kept clean by irrigation; dichloramine-T is now often used for their dressing; or sterile ointments, such as zinc oxid, or antiseptic powders that will dry secretions and act as tissue stimulants, such as aristol. The methods of applying such remedies were described in Chapter XVI.

Infected wounds are left open and are either treated by one or other of the methods described on page 620 or the Carrel-Dakin treatment is used, or, sometimes, when the wound is in a limb, especially an arm, the part is kept in a bath of antiseptic. Special tubs are provided for this purpose, but a shallow foot tub will answer the purpose. A very important consideration when using such baths is to make the patient comfortable. Pillows, protected with rubber cases, must be placed against the tub where they will support the part of the limb not in the bath, and, if necessary, the part in the bath must also be supported; hot-water bags or a hammock made of muslin can be used for the purpose.

Two very important points to be remembered in connection with the antiseptic treatment[1] of wounds are

[1] When ordinary sterile dressings are used for wounds the treatment is said to be *aseptic*, but when antiseptics are added to the dressings or used as described above the treatment is said to be *antiseptic*.

that (1) the majority of solutions that can be used for this purpose are unstable and they react, not only with constituents of the bacteria but also with substances in the wound—*e. g.*; the proteins of blood-serum, pus, etc.—and thus in a short time there is no active substance left to act upon the bacteria. Thus the solution must be renewed at regular intervals. (2) Every part of the wound must be in contact with the solution. If any part is protected from it by any means, the organisms there will not be destroyed and it will remain a focus from which infection may spread. Special points of importance with the Carrel-Dakin treatment will be mentioned in connection with the description of that treatment.

As soon as the wound is sterile it is sutured, unless there has been so much loss of tissue that this is impossible, in which case it must heal by granulation and is treated accordingly.

Important items for nurses to remember when preparing for and doing surgical dressings are[1]:

1. Always dress aseptic before suppurating wounds.

2. Observe all the precautions against breaks in aseptic technique mentioned in Chapter X.

3. Moisten adhesive plaster and adherent gauze before attempting to remove them; hydrogen peroxid,[2] alcohol, sterile water, or an antiseptic solution can be used for the purpose. The moistening minimizes pain and the abrasion of skin by the plaster and granulations by the gauze.

[1] The reasons for the precautions mentioned will be appreciated if the principles involved in the treatment of wounds mentioned in the beginning of this section are remembered.

[2] Hydrogen peroxid is particularly good to use for this purpose for the oxygen which it holds in loose combination unites with organic matter in the blood, etc., and decomposes it and thus the dressing is loosened.

4. Pull adhesive strips toward the wound on both sides and pull them quickly.

5. Use sterile forceps to remove dressings from a wound and to hold sponges that you use for wiping discharge from the skin, but do not use the same ones for handling the sterile supplies.

6. When washing the skin around a wound, wipe in the same direction as the wound or away from it (never toward it), if you wash away from the wound prevent any traction on it if necessary by placing the thumb and fingers of your left hand on each side of it (but not any nearer than necessary), on a line with the part you are washing.

7. Do not touch anything sterile with your fingers that you can handle with forceps, even when you are wearing gloves.

8. Do not squeeze a suppurating wound nor any localized collection of pus, as a boil, for doing so may force the virus through the adjacent tissues. Bier's cups are sometimes used to remove pus when force is needed, or else the wound is laid open and the Carrel-Dakin treatment instituted.

9. If you are told to use peroxid of hydrogen in a wound, irrigate it very thoroughly afterward so as to remove all the decomposed material.[1]

10. Remove discharge, sloughs, and the like from a

[1] Hydrogen peroxid was formerly very much used in the treatment of infected wounds because blood, pus, and muscle exudates contain an enzyme that hastens the liberation of its excess oxygen and this unites rapidly with such substances as pus and blood and promotes an effervescence that forces this matter to the opening of the wound. It was found however that it also frequently forced it into the adjacent tissues and irritated the wound and thus it is not now used as much as formerly; the Carrel-Dakin treatment or, in some cases, application of Bier's cups being substituted.

wound by irrigation or with the forceps, not by rubbing with sponges.

11. Use an irrigator or syringe for irrigation, do not squeeze the solution from sponges.

12. Be very careful when irrigating a sutured wound, such as that existing after perineorrhaphy, to regulate the flow so that there will be no pressure thrown on the stitches. The parts must be thoroughly cleaned and dried by gentle pressure with sponges, but there must be absolutely no traction on the stitches.

13. When a caustic, such as silver nitrate, is to be used after irrigation, first absorb the moisture with gauze, or it may spread the caustic, but do the drying by pressing gauze gently over the part, never by rubbing it.

14. When using a caustic touch only the granulations that need such treatment, never the skin or healthy granulations.

15. When packing a wound with gauze, do not rub it and do not press the gauze down tightly; this should be fluffed and loose, otherwise it will not absorb the wound secretions readily and will thus interfere with drainage. Packing is used to facilitate drainage and to prevent the upper part of a wound closing until the lower portion is filled in with new tissue so that there will be no pocketing of pus.

16. When discharge from a wound irritates the skin, the latter is covered with sterile vaseline or ointment.

17. Always notice, report, and record any abnormal condition in a wound. Record any change made in the dressing[1] and the number of drains or pieces of packing inserted.

18. Always reinforce a dressing as soon as discharge

[1] A change of dressing is of course only made upon the surgeon's prescription.

comes through to the surface, for not only does the soiled dressing look unsightly, but the gauze is no longer impervious to germs and the discharge affords favorable conditions for their propagation.

Demonstration 99

Dressing Wounds

Requisites.—1. The dressing carriage with the usual supply of dressings, sterile towels, gloves, solutions, instruments,[1] sterile and unsterile bowls, and lotion glasses, dressing rubbers, paper bags or whatever receptacle is used to receive waste dressings, adhesive plaster.

2. Kelly pad.
3. Pail.
4. Irrigator stand.
5. Irrigator with tubing provided with clamp.

Preparation of the dressing carriage.—(Note should be made of the regulation equipment of the dressing carriage for, when preparing it for use, one of the very important essentials is to make sure that everything likely to be required is on it and in its place. Having a regular place for everything on a dressing carriage makes it very much easier to be sure that nothing is missing.)

When a number of dressings are to be done, as many

[1] For the dressing of a closed wound two pair of sterile forceps will probably be the only instruments required. If stitches are to be taken out a pair of sharp-pointed scissors will also be needed.

For an open wound two pair of forceps, a pair of scissors, a probe, an irrigation tip and syringe will be needed. There must always be a dairy thermometer and a long pair of dressing forceps in a deep glass or bottle containing alcohol 95%. The latter is to be used for taking dressings, etc., from the jars.

dressing[1] and kidney[2] basins and lotion glasses[3] as will be required are sterilized and piled between the folds of a sterile towel upon the top shelf of the carriage; the instruments likely to be needed are sterilized and placed in the instrument tray between the folds of a sterile towel; a sterile dish with a pad of gauze in the bottom is placed on the top shelf to receive instruments after they have been used[4]; the bottles of alcohol, ether, and other small ones containing liquids likely to be needed are left on the top shelf and their rims are washed with alcohol or other disinfectant, a sponge wet with disinfectant is placed over the stopper and another around the neck of each bottle; a bundle of sponges and one of gauze fluffs are placed in sterile dressing basins; they are left in their wrappers but these are arranged so that they can be easily opened with forceps. Solutions used for irrigation and syringing should be about 100° to 105° F.; it is well to have both hot and cold solutions on hand; they are usually kept until needed on the lower shelf of the carriage and a folded towel should be placed under the flask of hot solution. The bandages, binders, dressing rubbers, and other unsterile articles are placed on the lower shelf and a vacant space is left on this shelf on which to put dressing bowls after use. The place for the receptacle to hold soiled sponges varies; Fig. 115 shows a dressing carriage with two large metal boxes on one end; one of these boxes is intended to hold a paper bag in which the soiled sponges and dressings are put and the other one is for used dressing towels. A metal slab divides these boxes from the

[1] Basins for solutions and sponges.
[2] Basins used to catch drainage.
[3] These are used for hydrogen peroxid, alcohol, and the like.
[4] The dish is sterilized because as it, for convenience, is on the top shelf it may come in contact with sterile supplies.

rest of the carriage. The irrigator, after being sterilized, is generally hung on the stand and covered with a sterile

Fig. 115. Dressing carriage.

towel. The same irrigator can generally be used for a number of dressings, a fresh tip being attached for each dressing.

The assistance that a surgeon requires from a nurse when dressing wounds usually consists in the preparation of the patient, placing the dressing carriage in position, lifting the covers of jars, etc., that he may get sponges and dressings when required, pouring out solutions and arranging for irrigation when necessary, putting on the

bandage or binder. To do even these things well, however, requires concentration of attention and endeavor to remember how the different surgeons whom you assist like things done, for, though the general order of procedure in doing dressings is generally about as described on page 630, surgeons vary more or less in the details of their methods, the solutions they use, etc.

When there are a number of dressings to be done and there are two nurses to assist, one prepares the patients, except removing the dressings, does the bandaging, makes each patient comfortable as soon as the dressing is done, and resterilizes the instruments, etc., if necessary, while the other nurse, whose hands are disinfected and covered with gloves, removes the dressings and assists the surgeon.

Procedure in the preparation of the patient.—If irrigation is to be used, draw the patient to the side of the bed and make her as comfortable as possible. Place a rubber and, if necessary, the Kelly pad in position to protect the bed.

Turn the bedclothes back to expose the wounded area and, if this entails exposure of other part of the body, *e. g.*, the chest, cover it with a shoulder wrap.

Remove the bandage or binder.

Unless there is a second nurse whose hands are disinfected, wash yours—and then, put on gloves with forceps, remove the outer layer of dressing, all that does not adhere to the wound. If there is adhesive plaster over the dressing moisten the parts adhering to the skin with, preferably, peroxid of hydrogen, but alcohol, sterile water, or solution can be used, take hold of one end and pull it quickly toward the wound, do likewise to the other end.

Place sterile towels in place to protect the wound and

dressing from the bedclothes. If the dresser is not ready put one of the sterile towels over the wound.

Procedure in dressing a clean wound.—Disinfect your hands and assume gloves.

Moisten the adherent gauze with peroxid of hydrogen or sterile solution; this can be poured from a small glass or sprayed over the gauze with a syringe.

Take hold of the gauze with forceps and remove it, but use no force; if it is still adherent moisten it further.

If the wound is a closed one, all that will be necessary, unless stitches are to be removed, will be to wash the skin surrounding the wound with alcohol or ether in order to remove dried epithelium and the remains of the adhesive plaster and then cover the wound with a fresh fluff of sterile gauze; put on the adhesive straps and the bandage or binder.

To remove skin sutures.—Take hold of a suture on one side of the knot with the forceps, cut it on the other side as close to the skin as possible, and then draw it gently backward and out.

Some surgeons have the suture holes painted lightly with 3% iodine and others prefer that a compress wet with alcohol be put over the part for a few minutes before the dressing is applied. The latter usually consists of a fluff of sterile gauze secured in place with adhesive plaster and a bandage.

If the wound needs irrigation make sure that the bed is properly protected.

Remove the adhering dressing and packing; while doing this it may be necessary to moisten the gauze frequently.

If only a small amount of irrigation is required, have your assistant hold a sterile kidney basin in position to receive the discharge, otherwise the Kelly pad is used.

While irrigating, direct the current so that, except where there are sutures, it will fall quite forcibly against the surface of the wound, and make sure that every portion of the wound gets its turn. If the wound is a deep one it is often advisable to have the patient lie part of the time in such a position that the wound can be filled with solution and then turn so that it will flow out.

If a caustic is needed, follow the directions given on page 625 and then apply the prescribed dressing.

Demonstration 100

Carrel-Dakin Treatment of Wounds

Requisites.—1. Two pair of sterile forceps.

2. Sterile scissors.
3. Sterile gloves.
4. Sterile towels.
5. A sterile dressing basin containing Dakin's solution.
6. Sterile gauze compresses.
7. Gauze squares sterilized in vaseline.[1]
8. Sterile pads.[2]

[1] Pieces of gauze 8 to 10 cms. (about 2½ to 3 inches) square are placed in vaseline and sterilized in the autoclave. Gauze with 24 threads to the inch is best for the purpose. These pads are put around the wound, as described later, to protect the skin from the solution.

[2] These consist of a layer of absorbent cotton and a layer of non-absorbent cotton surrounded with gauze and stitched around the edges. The pad is made large enough to surround the part of the body in which the wound is located and to extend three or four inches above and below the wound. Such pads are intended to protect the bed from moisture should there be any overflow from the wound. The absorbent cotton, which is placed next the skin,

9. Sterile safety pins and spring clothespins.

10. A bed cradle.

11. A Bradford frame or suspension or traction apparatus will probably be used if the wound is complicated with a fracture or if it is on the under surface.

12. An irrigator stand.

13. Dakin's solution.[1]

14. The Carrel apparatus. This consists of (1) a reservoir for the solution. (2) Tubing of red rubber with a caliber of 7 mm.; this is attached to the reservoir and must be of sufficient length to allow of the latter being hung about three feet above the wound. It is to be provided with a clamp. (3) A Y-glass connecting tube is required if there is more than one wound or if a wound

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absorbs the moisture and the non-absorbent cotton prevents its ready escape, but does not interfere to any extent with evaporation, as rubber or similar material does.

[1] The essential constituent of Dakin's solution is hypochlorite of soda. Soda and, sometimes, boric acid are added to lessen the irritability of the hypochlorite. The solution is prepared by the pharmacist but the description of the Daufresne's method (which is the one in common use at the present time) is given here as a matter of interest.

The constituents and amounts to make 10 liters of solution are as follows: Chlorid of lime (having 25% active chlorine) 184 gm.; carbonate of soda (either anhydrous, carbonate de soude Solvay, Fr. 92 gm. or crystals 262 gm.); bicarbonate of soda 76 gm.

One method of preparing it is as follows: In a 12-liter flask put 200 gm. of chlorid of lime and five liters of tap water. Shake this vigorously two or three times and let it stand over night. Dissolve the carbonate and bicarbonate of soda in 5 liters of cold water. Pour the soda solution into the flask with the lime, shake this very vigorously for a full minute, and then allow it to stand for half an hour that the carbonate of lime may settle to the bottom of the flask. Then siphon off the clear liquid and filter it through doubled filter paper. The liquid must be perfectly clear. It must be kept until needed in a cool place and away from the light.

is so large that two distributing tubes are required; the straight arm of the tube is inserted in the irrigator tubing and a piece of rubber tubing (the same kind as that on the irrigator) about ten to twelve inches in length is attached to each branch. If the continuous instillation method[1] is used a dropper such as that used with the protoclysis outfit and one short piece of tubing will be needed instead of the Y-tube. (4) A glass distributing tube or two if a Y-tube is used. Distributing tubes with one, two, three, or four outlets are to be had. Those with one outlet consist of a straight tube with a bore of 7 mm. at one end and 4 mm. at the other, those with more than one outlet consist of a straight tube with a bore of 7 mm. which is attached to the irrigator tubing and branches with a bore of 4 mm. projecting from the sides. (5) Rubber instillation or conduction tubes, one for each branch of the distributing tube or tubes. These tubes are of red rubber with an interior diameter of 4 mm. They must be flexible so that they can be bent to follow the contour of a wound and yet firm enough to resist the pressure of the muscles. They are arranged for use in four ways[2]: (1) The tubes are cut in lengths of 30 to 40 cm. (approximately 12 to 16 inches); they are closed at one end by a suture and holes with a diameter of about ½ mm. are made at regular intervals around the sides of this end of the tube, about eight holes to each 5 cm. of the tube punctured. The length to be punctured will depend upon the size of the wound. The holes must not come

[1] There are two methods of instillation used, continuous and intermittent.

[2] Tubes ready for use can now be purchased, but it requires only a little care to prepare equally adequate ones as described above. In writing this description the author has consulted *Le Traitment des Plaies Infectées*, Carrel et Dehelly, Masson et Cie., Paris.

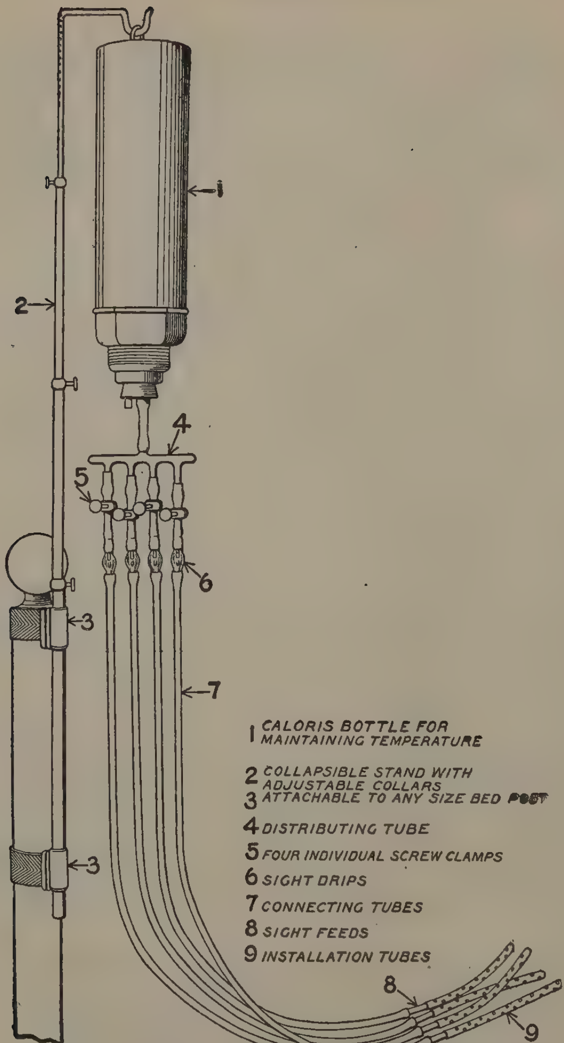

Fig. 116. The Mulford Carrel-Dakin apparatus.

above the surface of the wound. As a rule a tube of 30 cm. long is punctured over a length of 5 to 10 cm. and one 40 cm. in length for 15 or 20 cm. (2) The second type is the same as the first but a piece of Turkish toweling is rolled about the segment in which the holes are made. This must be firmly fixed by sewing so that there will be no danger of its being left in the wound when the tube is withdrawn. It is intended to aid in distributing the liquid which passes through the holes. It is only used for surface and small wounds in which there is not much discharge, for if there is discharge present, it is absorbed by the toweling and forms a coating over it that interferes with the distribution of the fluid. (3) The third variety, which is used for surface wounds, is left open at both ends and these are put over the branches of the Y-tube (so that the instillation tube is almost in a circle). The tube is cut a suitable size for the wounds and the holes are punched in the sides of the middle third of the tube, where they will allow of the solution flowing over the surface of the wound. The shape of the circle can be altered as required by tying with a piece of suture. (4) In the fourth method, the tube is left open at both ends, and about ½ cm. above the opening which is to go in the wound, a hole 4 mm. in diameter is made. This type of tube is used for continuous instillation.

Important points to be considered in connection with the Carrel-Dakin treatment of wounds are:

1. The solution must be properly prepared, otherwise, it may be very irritating to the skin or useless as a wound disinfectant.

2. Antiseptic technique must be carefully maintained.

3. The tubes are to be so placed in the wound that the solution issuing from them will come in contact with every particle of its surface; thus, if there are cavities or

crevices, the tubes must be suspended in them in a manner to allow of the surfaces of their walls being thoroughly bathed; if a wound is relatively long transversely a tube is laid along its floor.

4. The tubes must not be placed near enough together to block the apertures in their walls.

5. There is to be no gauze in the interior of the wound for it will absorb the secretions and thus become somewhat impervious to the solution and interfere with its bathing the wound.

6. The tubes must be secured in place as otherwise they may slip after the pad is in place and some part of the wound may then be deprived of its share of solution; the upper part is particularly likely to suffer from such cause.

7. The action of the apparatus must be inspected before the wound is covered and, occasionally, afterwards when the clamp is opened to supply the wound with fresh solution.

8. If the intermittent method of instillation is used, the solution must be allowed to run into the wound every two hours punctually.

9. The quantity of fluid introduced must be as much as the wound will hold without overflowing. A comparative estimate is about 10 c. c. for each tube used, but the amount that can be used has to be ascertained with each wound. If the right amount is used, the wound will be filled at the time of instillation, but the fluid will practically have all evaporated at the end of two hours. If too much solution is used the gauze with which the wound is covered, and the pad, will not be able to contain it all and the bed will become wet. If there is not enough used the wound will not be sufficiently disinfected and there will probably be pus in the wound at the next dressing

and the daily bacteriological count will show little or no diminution in the number of bacteria. To use too little solution is even worse than to use too much.

10. The pressure with which the solution is allowed to enter the wound should not be greater than that gained by placing the reservoir, or if the continuous method is used, the lower level of the dropper, three feet above the wound. Pain is likely to be caused if the pressure in the wound is too great.

11. A tube with the lateral perforation is to be used for the drop (continuous) method as there will not be enough liquid flowing through the tube at a time to force its way through the numerous minute apertures.

Procedure when arranging for an intermittent instillation.—After the utensils have been collected and sterilized[1] and the irrigator tubing connected to the reservoir, hang the latter on the stand, close the clamp on the tubing, put the solution into the reservoir.

Make the patient as comfortable as possible in the best position for the retention of fluid in the wound. Put a pad under the part, placing it so that when, later, it is brought around the ends will meet over the wound.

Prepare the wound as for an ordinary dressing.

The dresser in the meantime prepares his hands and puts on gloves. He then surrounds the wound with sterile towels and connects the conducting tubes to the glass distributing tube. While doing this he touches the tubes only at the point of connection with the distributing tubes; the portions of the tubes which will go in the wound are kept in the sterile towel in which tubes were

[1] The tubes are sterilized by boiling them for five minutes. They are taken from the sterilizer with forceps and placed between the folds of a sterile towel. The rest of the apparatus is sterilized in the usual manner for utensils of similar material.

placed when they were taken from the sterilizer, until they are put in the wound. The end of the main arm of the distributing tube is then inserted in the irrigating tubing, or if a Y-tube is used, the tubing connected with this.

The dresser then takes the towel with the tubes upon it in one hand and places the tubes, one by one, where it seems advisable.

You will then be required to open the clamp so that the solution may flow into the wound. Be ready to close the clamp if the dresser needs to adjust the tubes. Watch the amount of fluid that is used because the quantity required to fill the wound will be the amount that will be needed for its subsequent refilling. If the irrigator is not a graduated glass one, the time required to fill the wound should be marked for subsequent guidance.

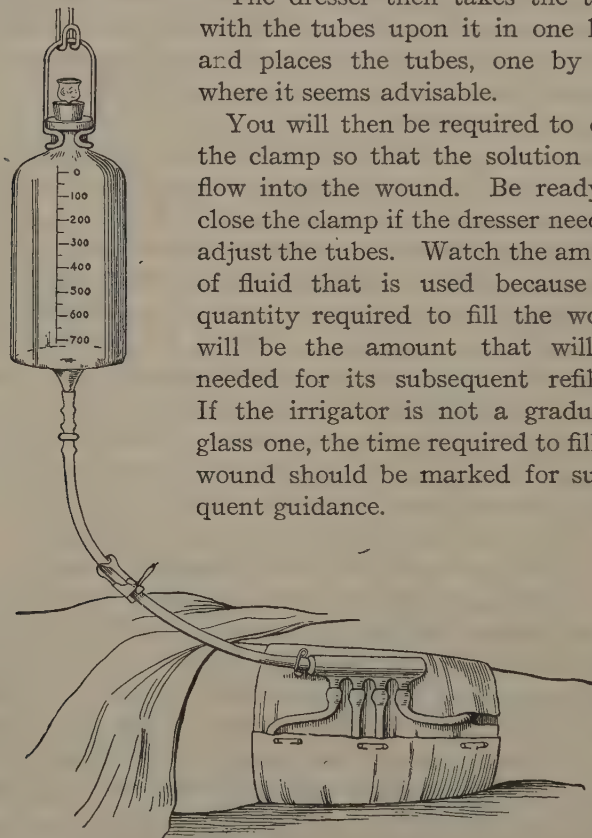

Fig. 117. Carrel apparatus in use for wound of thigh, showing the conduction tubes inserted where the pad is pinned and in a slip made in the lower edge of the pad.

The dresser then puts compresses, wet in Dakin's solution, over the wound and arranges them so that they will help to keep the tubes in place. Next squares of vaselined gauze (in about two layers) are put over the skin around the wound. These are taken from the jar in which they were sterilized with sterile forceps. Because of the vaseline, they will adhere securely to the skin and thus protect it should there be any overflow of solution from the wound. This is necessary as the solution irritates the skin.

The pad is then brought around the part and, if the position of the tubes does not allow them to emerge where the pad is to be fastened, slits to accommodate them are made with sterile scissors. The pad is secured with either sterile safety pins or spring clothespins.

The tubes are then secured in place on the highest level of the part with safety pins which are put through the pad and over the distributing tube or tubes at the connection with the irrigating tubing. It is important that the glass be included as, otherwise, the grasp of the pin will not be sufficiently secure.

As previously stated the clamp is to be opened for few seconds to allow of the wound being filled with solution every two hours and, as often as necessary, the pad must be unpinned and the position of the tubes noted and adjusted if necessary.[1] The total quantity of fluid injected in twenty-four hours usually averages between 250 and 1200 c.c. according to the size of the wound.

The wound is dressed every twenty-four hours and each time this is done a culture is taken. The dressing usually consists in the removal of the compresses, the inspection

[1] This will depend considerably upon the wound for in some wounds it is relatively easy to adjust the tubes securely and in others quite difficult.

of the tubes and their readjustment if necessary, the application of fresh compresses and, if necessary, a new pad.

The length of time required for this treatment to be effectual, *i. e.*, for the wound to become sterile, depends upon (1) the length of time that the infection has been in progress, (2) the amount of necrotic tissue present, and (3) the perfectness of technique. It has been found that when the treatment is commenced early and properly carried out even severe infections may be overcome in from five to twelve days.

Procedure when arranging for continuous instillation.—This, except for the following differences, is similar to that for an intermittent instillation. A short piece of tubing such as attached to the Y-tube is attached to the irrigator, this is provided with a screw clamp that will serve to control the flow of solution, and a dropper such as that used for the drop method of the protoclysis is inserted in the free end[1]; the longer irrigating tubing is attached to this and, to the latter, a straight distributing tube with one conducting tube of Type 4. The rate of flow is regulated to about five or six drops per minute. This method of instillation is used for small wounds in which the liquid will remain in quantity.

After use the tubes are syringed out with first cold and then warm water, scrubbed with a brush, soaked all night in Dakin's solution, washed and syringed with ether, and then boiled for thirty minutes in a sodium carbonate solution.

[1] The bottom of the dropper, it will be remembered, is to be about three feet above the wound.

CHAPTER XXI

Care of Patients Before and After Operation

Preparation of patient for operation: reasons for the procedure of preparation; general primary preparation, local primary preparation; extent of area to be prepared for different operations; final preparation. Usual condition of post-operative patients. Post-operative complications. Necessary post-operative care. Special care required after: (1) abdominal operations; (2) when there is profuse drainage; (3) after operations on the back; (4) perineorrhaphy; (5) rectal operations, and (6) operations on the eyes and throat.

Preparation of Patients for Operation

Reasons for the procedures of preparation.—The details of the preparation of patients for operation vary somewhat in different hospitals but the general principles are the same for there are always three main objects in view, viz.: (1) to make the patient as clean as possible, especially at the site of operation, and thus remove one source of infection; (2) to empty the stomach, and large intestine, and bladder so that (a) the intestines and bladder will not discharge their contents when their sphincter muscles are relaxed under the influence of the anesthetic; (b) an incision will not be made accidentally in any of these organs as has happened when they were distended during an abdominal operation; (c) there will be less danger of solid matter entering the trachea, a

very probable occurrence if there is food in the stomach when an anesthetic is given; (d) there will not be much material in the intestines to undergo putrefaction during the days following operation that the bowels do not move, this is important because intestinal putrefaction is associated with the formation of gas and this causes discomfort and is conducive to nausea; (3) to lessen the chances of a serious degree of shock. There is always more or less shock associated with all but the slightest surgical operations and if a patient is poorly nourished, worried, or frightened she will almost inevitably take longer to rally from the post-operative shock, and the shock is likely to be more pronounced than when the opposite conditions exist. Therefore, it is now customary, if a patient is poorly nourished provided the malady does not necessitate an immediate operation, to delay the operation until the health is improved and, in the meantime, to do everything to improve it including, if necessary, dentistry and the remedy of curable localized defects, such as superficial focal infections. Constipation must be prevented during this time and the diet should receive attention, it must be liberal, but only easily digested foods are allowed. To avoid ill effects from the fast necessary before and following operation all patients are now, if possible, given a liberal supply of easily digested food for a day or two before operation. Food with cellulose is withheld or restricted during the twenty-four hours preceding operation for very little cellulose is digested and therefore it increases the amount of residue in the intestines, but other carbohydrate foods are usually given in as large amounts as possible because a plentiful supply of glycogen in the liver and muscles, by providing an easily obtainable source of energy, is of value in preventing shock. If a patient is unable to take sufficient

food by mouth an enteroclysis of glucose-sodium bicarbonate solution is sometimes prescribed. The sodium bicarbonate is to inhibit acidosis, which is common after anesthesia and is conducive to shock. Until about six hours before operation the patient should, as a rule, drink all the water possible and many surgeons advise their patients to drink as much as they can during the preceding week.

To avoid fatigue at the time of operation as much of the necessary preparation as possible is done the preceding day and the patient should rest as much as possible. If she does not go to sleep early the doctor should be notified. Nurses must be on the alert to notice if pre-operative patients are worried or frightened and do everything possible to reassure and cheer them. That the health can be enormously benefited by proper suggestion has been abundantly proved by Christian Science, Faith Cures, etc., and it is now believed that a patient's mental condition is a very important factor in determining the rapidity of recovery from post-operative shock.

A hypodermic injection of morphine and atropine, or drugs with similar action, is now very commonly administered shortly before a patient is taken to the operating room because the morphine tends to lessen worry and nervousness and it promotes quiet and sleep, thereby assisting the action of the anesthetic, while the atropine tends to (1) overcome the undue contraction of the bronchial musculature which the ether, because of its irritant action on the respiratory mucous membrane, tends to promote; (2) check the secretion of saliva and mucus, which the ether stimulates, this effect is of importance for two reasons, (a) the presence of excessive secretion in the throat and bronchial tubes interferes with the passage of air; (b) when there is excessive secre-

tion, much of the material is swallowed and as the ether which is very irritating to mucous membranes, becomes dissolved in the secretion this is conducive to nausea and vomiting; (3) atropine tends to antagonize the depressant action of morphine on the respiratory center.

General Primary Preparation

Except in emergency, a **bath and shampoo** are given the day preceding operation, they must be very thorough and, if the patient is at all weak, given to her in bed.

Except in emergency, a **cathartic** is given usually, though not always, between eighteen and twenty-four hours before operation. In many hospitals there is a standing order for a certain one that is always given unless another one is specially prescribed. The qualities usually desired for a pre-operative cathartic are that it is of a kind to act upon the entire intestine, that it does not cause griping, that it is non-hydragogue. Between eight and six hours before operation a soapsuds enema is usually given and, if there is much fecal matter in the return either a colon irrigation or another enema. Many surgeons prefer the colon irrigation because it causes less distention of the intestine than the enema and therefore less distress and less tendency to induce post-operative constipation.

No solid **food** is given during the twelve hours immediately preceding operation, but, as a rule, strained soups and broths are allowed until about the sixth hour, after this even water is generally restricted or withheld, especially before abdominal operations, because if much water is taken the secretion of urine is stimulated and the bladder may become distended. If the patient is thirsty

however she should be given a mouth wash or gargle for any sensation of discomfort is to be avoided if possible.

A specimen of urine is sent to the laboratory before operation and it must not be forgotten before emergency operations. The most important things necessary to ascertain at this time are: (1) if there is sugar in the urine; (2) if the urine contains substances that denote abnormal conditions of the kidneys. Except in extreme emergency, an operation will not be performed while there is sugar in the urine, because this is likely to be due to diabetes mellitus and, if this is the case, a wound is not likely to heal properly, the reasons for this are given in Section 3, under Diabetes Mellitus. If the patient has kidney disease ether will not be used as an anesthetic unless absolutely unavoidable, since it is more or less irritant to the kidneys, and special care may be necessary to prevent acidosis.

Local Primary Preparation

For most operations, except in emergency, specified extents of skin surface are shaved and thoroughly cleansed after the bath and shampoo have been given. **The aims of this cleansing are** to (1) excite the activity of the skin glands in order to promote a profuse flow of secretion which will wash bacteria out of the ducts; (2) to free the surface of the skin from soil, loose epidermis, and bacteria. Common methods used for such cleansing were described in Chapter X.

When a patient is prepared for an immediate operation, if iodine is used for the final disinfection of the skin, the shaving is done without the use of soap and only detergents that evaporate quickly as ether, benzene,

and alcohol, are used for the cleansing, as described in Chapter X.

Extent of Area to be Prepared for Different Operations

Abdominal operations.—From the lower border of the nipples to that of the pubes and, on each side, to the bed-line. Special attention must be paid to the umbilicus.

Kidney operations.—From the sternum to the spine and from the axilla to the hip on the affected side.

Breast operations.—From the upper part of the neck to the waist line including the whole front of the chest and, on the affected side, to the bed-line.

Anterior neck operations.—From the border of the chin and the hair-line at the back to the nipples, including the shoulders and the upper part of the arms. The ears and surrounding skin must be thoroughly cleansed.

Scalp and back of the neck operations.—The face, ears, and the back to about the lower level of the scapulæ must be included in the cleansing, but for women patients the surgeon should be consulted regarding the extent of area to be shaved and, in many hospitals, a written statement of his desire in this respect is required.

Operations on a leg or arm.—Prepare at least five or six inches above and below the part to be operated on and, for operations on the upper part of an arm, the axilla must be included, while, for those on the upper part of the thigh, the groin and pubes must be prepared.

Vaginal and rectal operations.—Place the patient in the dorsal position and drape her as for a vaginal examination. Shave the pubes and skin surrounding the vulva and anus, cleanse these parts and the lower part of the abdomen, the upper one-third of the thighs, and the

lower third of the buttocks. For vaginal operations douches of green soap or lysol or other antiseptic detergent are generally given every four or six hours during the twenty-four hours preceding operation the last one being given as part of the final preparation.

Preparation for operations upon the mouth.—For some time previous to operation—usually about twenty-four hours—an astringent, antiseptic mouth wash and nasal douche are given about every three hours.

Special preparation for operations upon the stomach.—In addition to the external preparation the stomach is lavaged with sterile water, or a mild antiseptic, the washing being continued until the liquid returns clear.

Final Preparation

The final preparation of a patient for operation is generally commenced between one and a half and one hour before the time that she is to be taken to the operating room, the usual routine is about as follows:

Carry out any local preparation required at the site of operation.

If the patient has false teeth on a removable bridge take them out; put them in a glass of boric acid and place this where it will be safe until the teeth are needed. Wash the mouth with an astringent antiseptic mouth wash and if possible have the patient gargle her throat.

Brush or comb the hair and, for a female patient, braid it. Cover the hair with a muslin cap or triangular bandage, no pins are to be used to fasten this.

Put on the so-called operation stockings and a clean nightgown, in some hospitals short flannelet ones are used for this purpose.

Remove jewelry if worn, but if the patient objects to

the removal of a wedding ring consult the head nurse, if it is allowed to remain, unless it fits very closely, secure it in place with a piece of tape tied around the wrist.

A sedative is usually given by hypodermic one half hour before the time for operation.

The patient is required to void urine fifteen or twenty minutes before going to the operating room, if she is unable to do so and there is no order for catheterization, report to the head nurse.

Usual Condition of Post-Operative Patients

Items of a post-operative patient's condition that it is particularly important for nurses to realize are: (1) as the result of the depression of the central nervous system by the anesthetic there is more or less loss of muscle tone, both that of skeletal and visceral muscle, some of the especially important results of this are: (a) the blood-vessels are more or less relaxed and this and the loss of blood during operation promote conditions that favor shock: (b) Peristalsis is defective and this favors the accumulation of gas in the stomach and intestines and it interferes with the passage of material from the stomach into the intestines, therefore water, which is absorbed from the intestines and not the stomach, if taken by mouth shortly after operation, will not supply the body with fluid and is likely to be vomited; this is especially likely to be the case following abdominal operations because the exposure and handling of the intestines during the operation still further inhibits peristalsis; (c) the relaxed condition of the pharyngeal muscle allows the tongue to fall backward over the larynx and facilitates the passage of vomitus into the larynx if means are not taken to prevent these accidents; (d)

metabolism is inhibited and therefore heat production, consequently the temperature is likely to be lowered and unusual substances such as acetone may be found in the urine, this indicates a condition of acidosis and it is especially common when there has been much destruction of tissue or pus formation. (2) Sweating is usually profuse and therefore it is exceedingly important to keep the patient warm and wrapped in blankets which will absorb the moisture, otherwise the body is likely to be chilled and this favors the onset of shock and pneumonia. (3) The membrane lining the respiratory tract is irritated by ether and this produces a condition that exposes the patient to infection by organisms that cause colds, bronchitis, pneumonia, etc. (*it is to reduce the number of organisms in the mouth and thus lessen the danger of such infections that antiseptic mouth washes and gargles are used in preparation for operation*). (4) If much ether is used to maintain anesthesia the kidneys may be irritated by that which they excrete, even though elimination takes place chiefly through the respiratory passages. (5) The depression of the nervous system tends to lessen the secretion of urine and the bladder's ability to respond to stimulus. (6) Restlessness is likely to be extreme as soon as consciousness begins to return, especially if the patient was nervous or excited before operation, or was addicted to the over-use of alcohol, or is uncomfortable or in pain. (7) Nausea and consequent attacks of vomiting are to be expected after ether anesthesia, but they are less common after chloroform and nitrous oxid anesthesia, especially the latter, because these anesthetics do not induce as much irritation of the throat and stomach as ether does and this is one of the causes of nausea, another cause is the interference with the circulation in the cerebral blood-vessels. Normally the

nausea should cease as soon as the anesthetic is eliminated from the system and its failure to do so usually indicates complications, but it is sometimes prolonged in nervous individuals and when the preparatory catharsis was not thorough. (8) Thirst is usually extreme owing to the loss of fluid from the body as the result of (a) the bleeding that occurs during operation, (b) profuse sweating, and (c) vomiting. (9) The temperature is usually reduced during anesthesia (the reasons for this have been previously given), but later there is likely to be a reaction in which the temperature rises to about 100° or 101° F. and may remain slightly above normal for a few days, especially when the bowels do not move, but any marked fever is usually due to complications.

Post-Operative Complications

The complications of which there is most danger following surgical operations are:

(1) **Asphyxia** due to vomitus entering the trachea or the tongue falling back over the larynx. To prevent this accident, if a patient vomits, the head must be kept turned on one side so that vomitus will run from the mouth and the jaw must be pushed forward and upward with the fingers for this tends to keep the tongue pressed forward and the epiglottis over the glottis.

(2) **Acidosis,** the symptoms and causes of this condition have been already described. The usual treatment consists in the administration of sodium bicarbonate by protoclysis and, in severe cases, sodium carbonate as an intravenous injection.

(3) **Shock,** the causes and symptoms were described in Chapter VIII, the post-operative care taken to prevent it consists in keeping the patient warm and the head

lowered to facilitate the flow of blood to the brain. **If it** occurs, in addition to the above treatment, either a transfusion or an intravenous infusion of gum-glucose solution or of a saline solution and adrenaline is usually given.

(4) **Hemorrhage,** the symptoms are described in Chapter VIII. and the treatment in Chapter XXIII.

(5) **Intestinal paralysis,** the first symptoms are abdominal distention and pain and increased nausea. **The distention is due to** the accumulation of gas in the bowel and, as this tends to increase the inability of the intestine to contract properly, it favors intestinal paralysis, also it causes discomfort and may interfere with the heart's action, moreover, **abdominal distention may also be due to** other serious conditions, such as peritonitis and gastric dilatation, and therefore it should be reported at once. The usual treatment for distention due to lack of intestinal tone consists in the application of turpentine stupes to the abdomen, the administration of carminative enemata, and of a drug, such as pituitrin, that increase the contraction of plain muscle tissue.

(6) **Gastric dilatation,** this is a very serious condition, common symptoms are increased vomiting, intense thirst, scanty urine, and, in a short time, the symptoms of collapse. The exact cause of the condition is not definitely known, but the depression of gastric tonus is thought to be an important contributing factor, also it is thought probable that it may be partly the result of nervous reflexes and that some of the symptoms are the result of obstruction in the duodenum; this in some cases, it is believed may precede the gastric dilatation and be partly responsible for the latter and in others be due to the pressure of the dilated stomach. The usual treatment is the same as that for intestinal paralysis plus lavage and, sometimes the patient is placed in the prone

position with the pelvis raised, this position is said to afford relief by removing the downward traction of the mesentery on the duodenum and the weight on it of the dilated stomach.

(7) **Retention of urine** is a very common post-operative complication, its most common causes are: (1) depression of the nervous system which lessens the tone of the bladder muscle and inhibits the occurrence of the micturition reflexes; (2) nervousness. Occasionally what is known as retention with overflow occurs, especially when the patient is unconscious or apathetic. This was described in Chapter VIII.

(8) **Cystitis or inflammation of the bladder** is described in Section III, when it occurs following operation. except when the operation has been on one of the urinary organs, it is almost invariably the result of asepsis in catheterization.

(9) **Thrombosis,** *i. e.*, the formation of a thrombus which is a solid mass formed during life in the heart or blood-vessels from blood-constituents that, in the case of the vessels, causes a partial or complete occlusion, this is described in Section III under diseases of the vascular system.

(10) **Embolism,** *i. e.*, the transference of a solid substance, as a thrombus or blood clot, from one part of the body to another by the blood stream, for description see Section III.

(11) **Infection with pyogenic bacteria,** this may be due to septic processes existing before operation or to the entrance of bacteria through the wound or following operation. The infection may be localized to the wound or it may involve the cavity that was the seat of operation, or the germs may be absorbed by the lymph or blood and cause a septicemia or pyemia. The septic diseases

are described in Section III and the infection of wounds in Chapter XX.

(12) **Pneumonia,** this is a particularly probable post-operative complication, if care is not taken to prevent chilling of the body, especially after ether anesthesia. Post-operative pneumonia may also occur as the result of the inspiration of vomitus into the bronchi and, especially after operations on the nose or throat, of infective material from these parts. Embolism in which the embolus lodges in one of the pulmonary vessels may induce symptoms that at first are similar to those of pneumonia.

Post-Operative Care

The preparation of the bed to receive a patient after operation, the care necessary in lifting a patient from the stretcher to the bed, and the position in which a patient is placed under different circumstances were described in Chapters IV. and V. As there stated the bed must be warmed and the patient wrapped in warmed blankets in order to prevent shock and chilling of the body. As stated in the first part of this chapter, the profuse perspiration favors chilling, if the moisture is not absorbed from the body or if the body is exposed to the air, therefore the blankets should not be removed until diaphoresis ceases and, when it is removed, the body should be thoroughly dried with a warmed bath towel.

As soon as the patient is arranged in bed the pulse and breathing are to be counted and their rate and character charted, note must also be made of the patient's general condition and the time at which consciousness returns. After all extensive operations and when the patient is in poor condition or there is any special danger of hemor-

rhage the pulse must be counted and its character noted at least every fifteen minutes.

A patient must not be left alone until fully conscious. The care necessary to prevent vomitus getting into the air passages was described on page 650. After an abdominal operation during retching and severe attacks of vomiting a hand should be placed on each side of the abdomen and pressure made toward the wound in order to prevent tearing out of the stitches. After emesis the mouth should be washed with a mouth wash.

If the patient is restless the fact should be reported. Discretion must be used in the restraint of a patient's movements, too free movement must of course be prevented, but too much restraint may excite the patient.

Discomfort is one of the causes of restlessness and therefore it is most important to do everything possible to lessen it.

Thirst is one of the most common causes of discomfort. This can usually be relieved to some extent by washing the mouth with a lubricating mouth wash, one commonly used for the purpose consists of equal parts of albolene and lemon juice in eight parts of 2 per cent. boric acid solution. Ice is generally allowed by mouth and, if the patient is not nauseated, small amounts of very hot or very cold water. Sometimes, after operations on the limbs, even while the patient is nauseated, drinks of various kinds, such as hot tea, ginger ale, and carbonated waters, are allowed because they often, especially the carminatives, relieve the nausea and if, on the contrary, they cause vomiting no harm is done, in fact, by ridding the stomach of irritating matter, vomiting may relieve the nausea. After most operations on the brain, eyes, throat, and trunk, however, it is not always safe to risk increasing vomiting because such parts are more affected

by the movements associated with vomiting and retching. Such movements may, if there is infective matter present, hasten its absorption as explained in Chapter V.; this is especially likely to be the case in abdominal infections, also they may result in tearing asunder of sutured parts and in a sudden localized rise of blood-pressure which, in parts like the brain and eyes, might be very injurious and, following serious operations, they are likely to increase the tendency to shock. When conditions exist that exclude giving water by mouth for any considerable length of time it is given by protoclysis because it is very important that the system be supplied with fluid, not only to relieve thirst, but also for: (1) the needs of the tissue cells; (2) to prevent shock; (3) to stimulate the secretion of urine, and, sometimes, (4) to prevent irritation of the kidneys by the matter they have to excrete. For this reason, when protoclysis is not essential, as soon as nausea ceases, all the water possible should be given by mouth. In addition to water, glucose, to serve as fuel, and sodium bicarbonate, to lessen or prevent acidosis, are sometimes included in a protoclysis.

Nausea is another common cause of discomfort. To relieve it small pieces of ice are sometimes given by mouth, to be effective they must be swallowed as ice and not allowed to melt in the mouth.[1] When nausea is not controlled in this way the stomach is sometimes lavaged and drugs that act as antiemetics and small amounts of carbonated drink may be prescribed. An

[1] The melting of the ice prepared for this purpose will be retarded if the ice is kept out of the water that accumulated as it melts. A good method of doing this is to put the ice in small white enamel or aluminium strainer and place the bowl of the latter in the top of a glass. This is put on a plate with the spoon that is used to give the ice to the patient.

ice-cap on the throat and a counterirritant, such as a mustard paste, over the stomach are also sometimes used.

Pain in the lumbar region, which is another common cause of discomfort, is often relieved by rubbing the area and putting a support, as a small pillow or a hot-water bag, under the curve in this region.

A support under the knees such as one of those described in Chapter VI. is used to relieve **strain on the abdominal muscles,** but it is said that this position should not be maintained constantly and that the patient should be encouraged to move the legs (*except when there is some special reason why this should not be done*) because, some surgeons believe, a fixed position that is unfavorable for the venous circulation favors thrombosis.

As previously stated, the **urine** must be measured for at least forty-eight hours after operation and longer if micturition and the urine are not normal and following operations on the urinary organs. If urine is not voided within ten hours after operation, and later at ten hour intervals at the most, the head nurse should be notified. A specimen is sent to the laboratory the morning after operation and daily if the urine contains abnormal constituents.

As soon as possible post-operative patients are given a liberal **diet.**

Special Care Required After Certain Operations

Abdominal operations.—The various emergencies just described are particularly likely to occur after abdominal operations, especially those that have required much handling of the intestines or other organs, therefore, after such operations, patients need to be most carefully watched, especially for symptoms of shock and abdomi-

nal distention and the various procedures to ensure comfort and thus avoid restlessness are particularly essential. This is especially the case after **operations for suppurative conditions of any of the abdominal organs** since, as previously stated, movement favors the absorption of septic matter and uses up extra fuel which, when the food supply is limited, results in excessive catabolism of tissue and this favors acidosis for many of the products of tissue metabolism are of acid reaction; also movement favors the tearing apart of adhesions around septic matter and allows it to spread through the abdominal cavity as explained under peritonitis, Section III. After such operations the patient is put in a position that favors drainage from the wound, either Fowler's, the prone, or the lateral, these were described in Chapter V., and, as much change in position is not then possible, frequent massage and rubbing of the back and legs with alcohol is likely to be necessary to keep the patient comfortable. A protoclysis of sodium bicarbonate-glucose solution is usually prescribed. **After gastrostomy** (*an opening through the abdominal and stomach walls*) that is performed because of obstruction in the esophagus or cardiac end of the stomach, the patient is fed through a catheter or tube that is inserted through the wound into the stomach, the procedure of this method of feeding is described in Chapter XIII.

Special care needed when there is profuse drainage.—Especially after operations on the gall bladder, the urinary bladder, and the chest for empyema, there is likely to be profuse drainage. In some cases tubing is attached to a stationary tube that is inserted in the wound to serve as a passageway for the discharge and the free end of the tubing is placed in a glass bottle that is hung, as a rule, to a bar at the side of the bed. In such cases it is

important to look at the bottle at short intervals to see that the drainage continues uninterrupted for the tubing sometimes becomes kinked or, either it or the stationary tube may become blocked with clots or discharge. The means that can be taken to remove the obstruction from the tubing depend upon the nature of the apparatus used; in some cases a syringe can be inserted in the free end of the tubing and the piston pulled outward thus creating a vacuum in the syringe and tubing which favors the withdrawal of matter from the latter and, sometimes, even from the stationary tube: sometimes better results can be obtained by disconnecting the tubing and flushing it with water. If obstruction in the stationary tube cannot be removed with a syringe the surgeon usually has to be notified. The dressing must be watched and the outer layers changed if they become soiled with the discharge. As a rule the skin around the wound is lubricated with sterile vaseline or ointment to protect it from irritation.

Operations on the back.—After operations on the back the patient usually lies on the unaffected side, except when drainage is required, in which case it may be necessary for him to be turned so that the wound will be downward. In both cases he must be supported with pillows and in the latter position the pillows must be arranged in a manner to prevent pressure on the wound.

Perineorrhaphy.—The special care after perineorrhaphy, *i. e.*, suturing of the perineum, is directed toward preventing infection and tearing of the sutured parts. **The measures necessary to prevent infection are:** (1) to wash the parts thoroughly, as described in Chapter XII., after micturition and defecation and keep them covered with a sterile dressing, some surgeons require their patients to be catheterized for a day or two follow-

ing a perineorrhaphy operation. **To prevent the sutured parts being torn** several precautions are necessary (1) the patient must not be allowed to separate her legs widely and, if she is disposed to do so during the restlessness usually associated with the semiconscious period of recovery from anesthesia, a wide binder is sometimes put around the knees or thighs; (2) care must be taken when irrigating the parts not to allow the solution to flow with much force on the stitches and, if a vaginal douche is given, a catheter is sometimes used instead of the larger vaginal douche nozzle; (3) strain upon the sutured parts must be avoided during defecation, this is one of the most common causes of the tearing out of the stitches. As one safeguard a small enema is sometimes prescribed to be given when it is about time for the patient to have a bowel movement. At one time oil was much used for this purpose, but glycerine and warm water, about six ounces, is now very commonly prescribed as it is thought to penetrate fecal masses better than oil. Also a mild cathartic that induces soft or watery stools is generally prescribed. The patient should be cautioned to avoid straining and, if she seems unable to help doing so, the nurse should put on a sterile rubber glove and hold the sutured parts together. The success of a perineorrhaphy operation depends very greatly upon the post-operative care that the patient receives.

Operations on the throat.—Following operations on the throat it is especially imperative to watch for hemorrhage. After some throat operations an ice-cap is kept around the throat to lessen pain, congestion, and tendency to hemorrhage. Chopped ice is generally allowed by mouth, but, as a rule, nothing else for at least two hours and longer if there is nausea and after severe operations. After such operations as tonsillectomy, ice

cream and other soft solids are generally allowed a few hours after operation if the patient prefers them to liquids. After extensive throat operations food may have to be given by rectum or nasal gavage. The care required after intubation and tracheotomy is described in Chapter XXII.

CHAPTER XXII

Intubation. Tracheotomy. Artificial Respiration

Reasons for and nature of intubation and tracheotomy. The Schaefer and Sylvester methods of artificial respiration. Use of a pulmotor.

Intubation is the introduction of a firm tube into the larynx through the glottis to prevent asphyxia from obstruction in or above the larynx. **Tracheotomy is** the introduction of a tube into the trachea through an incision in its anterior wall. This operation is performed when there is an obstruction below a point that will be reached by an intubation tube. **Artificial respiration is used** when an individual cannot breathe naturally. It may be performed with the aid of an appliance known as a pulmotor or a lungmotor or without any apparatus. The pulmotor is of great assistance, however, especially when the respiration has to be maintained for a long time as is sometimes the case, especially in the treatment of opium poisoning.

Demonstration 101

Preparation for Intubation and Tracheotomy

Requisites for intubation.—1. An intubation set,[1] which consists of a mouth gag; tubes of different sizes;

[1] The intubation appliances were invented by the late Dr. O'Dwyer of New York and are therefore commonly known as the O'Dwyer Intubation Instruments.

obturators, which are the removable pieces of metal in the tubes into which the introducer fits; heavy thread, a loop of which should be in the hole that is in the rim of each tube; an introducer; an extractor.

2. A gauze compress.
3. A towel.
4. A sputum cup or kidney basin.
5. Scissors.
6. Adhesive plaster.
7. A small pillow.
8. A sheet.
9. A light and head mirror will be required unless the room is well lighted.

Requisites for demonstrating the cleaning of the tubes in the care of a patient after tracheotomy:

1. A tracheotomy tube.
2. Two pieces of tape about twenty-four inches long.
3. A curved probe.
4. A pair of forceps.
5. Two small dressing basins containing sterile water.
6. Small (about three inches) squares of sterile gauze.
7. A bag or other receptacle for soiled gauze.
8. A sand-bag or suitable substitute.

Requisites for tracheotomy.—Except in extreme emergency tracheotomy is performed in the operating room, but if necessary to prepare for it in emergency get, in addition to the articles mentioned, just a small, sharp scalpel, two or three artery clamps, scissors, forceps, two small retractors, catgut, sponges, gauze dressing, dressing towels, articles for disinfecting the skin, local anesthetic, sand bag; with the exception of the bag, everything, including the tubes, must, of course, be sterile.

Intubation

This procedure cannot of course be demonstrated in class, but the pupils should inspect the apparatus and understand the use of the different articles and memorize the instruction given so that they will be ready to give a doctor efficient aid if called upon and be able to understand his instruction if shown how to perform the operation in his absence, which is sometimes necessary, for the tube occasionally comes out when the patient coughs.

Procedure.—Choose a tube the required size. Those intended for children are numbered and the one with the number nearest the child's age is usually the most suitable. Connect the introducer with the obturator in the tube. Arrange the light in position as described for examination of the throat in Chapter X. Place the patient in position. An adult is usually wanted in the dorsal recumbent position on a table or at the side of the bed. Put a small pillow or suitable substitute under the neck so as to throw the head slightly backward and thus extend the throat, otherwise the head must be perfectly straight. A child is sometimes wanted in the same position, but many physicians prefer to have the nurse hold a small child in her lap. For either of these positions, the child, unless it is old enough not to resist, is to be wrapped in a sheet as described in Chapter X. If the child is to be held one nurse sits with it in her lap and holds its legs between hers, as in Fig. 37, and puts her arms across the child's arms and chest. Another stands behind the child and grasps its head firmly, holding her thumbs on top of the head and her fingers under and at the side of the chin, and draws the child's head upward as far as possible, keeping it in a perfectly straight line.

While inserting the tube, the operator sits or stands

facing the patient. After putting in the mouth gag, if this is necessary, he introduces the index finger of his left hand into the mouth and, with it, holds the tongue down and the epiglottis forward. After seeing that the thread loop is free, he passes the tube and connected introducer into the mouth, alongside of his finger, slips the tube into the trachea, presses it into position with the finger of his left hand, and then, immediately, removes the obturator from the tube by pulling upon it with the introducer to which it is attached.

One nurse is to be ready to hold the sputum cup to receive the discharge of mucus, etc., that is generally forced up as the air comes through the tube.

If the tube is in the trachea, as soon as the coughing and expectoration that its introduction usually excites are lessened, the patient's breathing and color will be improved. If, as sometimes happens, the tube has been inserted in the esophagus, no improvement will take place. It is to prevent the tube being swallowed should it be so misplaced that the thread is attached to it and, if the tube is in the esophagus, it is pulled out by making traction on the string.

The loop of thread is sometimes left attached to the tube as long as the latter remains in place but, as a rule, it is removed as soon as the tube is in place and, when the tube is no longer necessary, it is removed by means of the extractor. If the thread is to be removed, cut off the knot, for, if the loop is cut, but the knot left on, the knot may be drawn to the hole in the tube and cause the tube to be displaced. If the thread is left on, put the loop over the patient's ear and a strip of adhesive plaster over the thread across the cheek. An objection to leaving the thread is that a child is likely to pull it and thus drag the tube out of place.

The method of feeding a patient after intubation has to be considered for the presence of the hard tube in the trachea interferes somewhat with the normal movements associated with swallowing; also, it is much easier for material to enter the firm hole of the tube than the more pliant trachea. Thus liquid or semi-liquid food is given, and it has been found that, as a rule, if the head is lowered backward, the passage of food is facilitated. For this reason, it is customary to put a pillow under the shoulders of an adult or large child, allowing the head to extend beyond it and slightly backward, and if the patient is a small child, to either place it on a table, with its head extending beyond it and supported at a lower level, or to hold it on the lap with its neck at the edge and the head tilted slightly backward.

Tracheotomy

The only procedure connected with this operation that can be demonstrated is the care of the tubes while in use. This however is very essential for, especially during the days immediately following the operation, the inner tube frequently becomes blocked and it may be necessary to disconnect, wash, and replace it very speedily.

For the tracheotomy operation the patient is placed in the recumbent position with the sand-bag under the neck and the head tilted backward, so as to make as much space as possible between the cartilages, the skin is disinfected, and the area surrounded by towels as described in Chapter X. The operator makes an incision into the trachea, introduces the tubes, one inside the other, and puts a piece of sterile gauze between the wound and the plate of the outer tube. In the rim of the larger tube

there is a slit on each side through which a piece of tape is put and these are tied around the neck to hold the tube in place. There is also a clamp on the top of this tube and a groove on the top of the smaller one into which the clamp fits when the small tube is inside the larger one. The reason for the double tube is that, for some time following the operation, discharge is likely to block the tubes frequently and the easiest way to rectify this is to remove the inner one, wash, dry, and replace it. This prevents the necessity for any exposure of the wound.

Special care of patient after operation including washing the tube.—If the inner tube becomes blocked with discharge, turn the clamp holding it in place and gently remove it, keep a finger on the rim of the outer tube while doing so in order to prevent it moving and irritating the wound. Put the small tube into a basin of water, wind a piece of gauze around the curved probe, and move this around inside the tube, dry the tube thoroughly for if water drops from it into the larynx a violent fit of coughing may be induced, reinsert the tube.

A piece of moistened gauze is kept over the opening of the tubes or else the air is kept moist by the use of a steam kettle as described in Chapter XV., because air entering the trachea through the tube is not moistened as it is in passing through the nose and pharynx, and dry air is likely to irritate the larynx and provoke coughing.

The basins containing the water for these purposes, the gauze, probe, and receptacle for soiled gauze should be kept on a tray and covered with a sterilized towel. The water for washing the tube must be changed as often as it is soiled, that for moistening the gauze, three or four times a day.

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FIG. 118.—THIS ILLUSTRATION SHOWS THE PULMOTOR RESTORING TO LIFE A MAN WHO HAS APPARENTLY CEASED TO BREATHE.

Demonstration 102

Artificial Respiration

Requisites for artificial respiration.—1. A pulmotor or lungmotor. 2. A watch or clock.

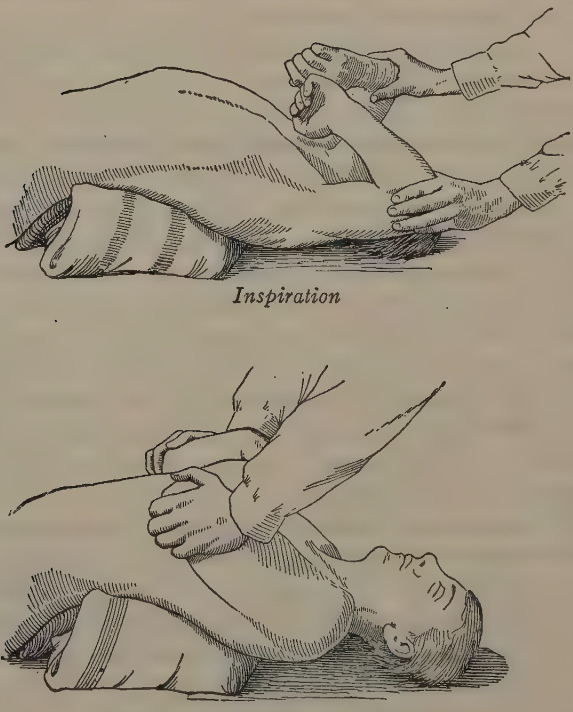
Artificial respiration, as previously stated, may be given with a pulmotor or lungmotor or without any apparatus. The method of using a motor is so dependent upon the type of machine and there are so many varieties that it is hardly advisable to attempt to describe the details of procedure, especially as, where there is a pulmotor to be had, there is usually a doctor, and printed directions for the use of a machine are generally to be found in its container. There are, however, certain **points to be remembered when giving artificial respiration** either with or without a machine; viz., the movements are to be slow and even, without jerking or violence but they must be forceful. Evenness of motion is particularly essential when a lungmotor is used in which a tube is inserted in the trachea and the air pumped directly into the lungs. Another precaution in the use of such a machine is that the opening (present on the tube in the majority of types) for the egress of air from the lungs is to be closed when air is being pumped into the lungs and opened when the pressure on the pump or bellows is released, *i. e.*, in expiration.

The methods of artificial respiration most commonly used without a machine are those known as the *Sylvester* and the *Schaefer* methods and the pupils should be shown how and practice giving artificial respirations in these ways on each other for it is most important that nurses should be able to carry out these methods properly, since in poisoning by a number of drugs, and other emergencies, breathing ceases before the heart action and

if forced breathing can be maintained until the respiratory center assumes control, the person's life may be saved.

The Schaefer method is easier to perform and generally considered a better one than the Sylvester, especially when resuscitating a person after drowning, but it is not always applicable in the emergencies that occur in the care of the sick.

The Sylvester method is as follows: Place the patient on her back, with a pillow or a substitute under it at



Inspiration

Expiration

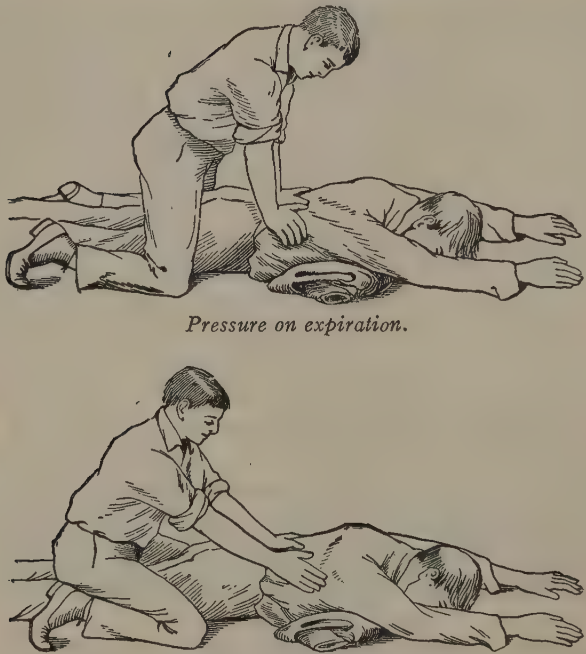
Fig. 119. Sylvester method of artificial respiration

about the waist line, so as to raise the lower part of the chest; there should be no pillow under the head. Stand or kneel at the patient's head, grasp the arms about the elbow, and draw them away from the body and upward as far as they can be extended. Hold them stretched in this position for about three seconds (these actions elevate the ribs and expand the chest in somewhat the same manner as inspiration); then slowly lower the arms until the chest is reached and press the elbows slowly and firmly against it on the lower ribs, so as to force air from the chest, *i. e.*, expiration. These movements should be repeated at such a rate that sixteen (counting the two processes as one) will be made per minute.

If the patient is heavy, it may require two persons to give the treatment and in such case stand or kneel as required one on each side, near the patient's head, and proceed as already described, being careful to work in unison.

With this method it is always necessary to watch that the patient's tongue does not fall backward over the larynx.

Schaefer method.—Lay the patient prone on the ground with a pillow or substitute under the lower part of the chest, the head turned to one side, and the arms stretched above it. Kneel across the patient's thighs, facing the head. Place your hands flat over the lower part of the back, on the lower ribs, your fingers pointing toward the sides; lean forward so as to throw the weight of your body upon your hands and thus make all the pressure possible upon the patient's chest; do this gradually and slowly (this movement, which is a substitute for expiration, will force air and, if it is present, water from the lungs); then, as gradually, relax the pressure by slowly straightening your back, but keep your hands in position. Repeat these movements of pressure and



Pressure on expiration.

Pressure off inspiration

Fig. 120. Schaefer method of artificial respiration.

relaxation at a rate that will allow of about sixteen (the two movements being counted as one) per minute.

Artificial respiration should be continued until natural breathing is resumed or all hope of resuscitating the patient has been abandoned.

SECTION II

CHAPTER XXIII

First Aid Treatment in Accidents and Other Emergencies

The principles of first aid treatment. The necessity for measures to prevent shock following accidents. The nature, causes, and first aid treatment of: shock, syncope, sunstroke, heat prostration, convulsions, chills, asphyxia, drowning, contusions, fractures, dislocations, sprains, and hemorrhage. Demonstration of first aid treatment for a person rescued from drowning, and of fractures, hemorrhage, and shock, and of lifting an injured person from the ground. Conditions that favor conflagration and accidents from fires. How to escape from a burning building. Means used to extinguish fires and demonstration of method when the clothing is on fire. Nature, results, and treatment of burns, scalds, frost-bite, and chilblain. Removal of foreign objects from the eyes, ears, air-passages, alimentary canal, and the flesh. First aid treatment for insect, snake, and dog bites, and food poisoning.

Principles of First Aid Treatment

What should be done and not done in emergencies.—

1. Do not get excited.

2. Send for a doctor at once and, if possible, let him know what has occurred.

3. Do not, unless absolutely necessary, attempt to give treatment that is usually performed by a physician or surgeon.

4. Do not, without a physician's advice, unless absolutely necessary, give drugs, other than the simple remedies mentioned in the pages following.

5. Try to prevent a crowd collecting around a person who has met with an accident, for this is likely to excite and disturb her.

6. When an accident occurs out-of-doors it is well to get the person into a house as quickly as possible, but before moving her ascertain if there is hemorrhage or fracture and, if so, take the means described later to prevent harm being done during the moving. If possible, when a seriously injured patient is to be taken home, send someone ahead to notify the family and to give warning that the patient is not to be excited and that a bed should be prepared for her. Naturally endeavor must be made not to alarm the family.

7. If the patient is frightened, reassure her and, if there is a severe wound or hemorrhage, take means to prevent her seeing the extent of the injury.

8. Following an accident that has caused terror or much destruction of tissue, treat the individual for shock, even though the symptoms of the condition are not particularly apparent.

Shock

The nature of this condition, the theories regarding its cause, and its symptoms were described in Chapter VIII., and its treatment in Chapter XXI. An important point, however, in the relation of shock to accidents that needs to be emphasized is that there will inevitably be some degree of shock associated with any accident that induces terror or that involves much destruction of tissue (the supposed reasons for this were given in Chapter VIII),

but there may be few if any symptoms at first because the associated excitement and fear stimulate the sympathetic nervous system and the results of this stimulation may for a time delay the onset of symptoms, but this very stimulation is likely to increase the degree of collapse later, especially if the individual is allowed to be active. Therefore, following an accident of any severity, one of the first things to do is to make the patient lie down with, unless there is injury to the head, the head lower than the heart. If the individual is out-of-doors any unevenness of the ground should be taken advantage of to get the desired position. Also, when carrying the patient the head should be kept low and therefore, the shortest carrier should support the upper part of the body. As soon as possible loosen the collar, tight waist bands, and corsets, but if symptoms of shock are evident it is not, as a rule advisable to undress the patient until the pulse improves, for this is likely to entail too much movement and, as stated in Chapter XXI. physical and mental quiet are most important, since the opposite conditions increase the activity of the heart. Warmth is also very essential and, if hot water bags are not to be had, glass bottles can be used, in order to fill these without breaking them pour the hot water over, as well as into them, and let them stand on something soft, as a folded towel, while doing so.

Syncope or Fainting

Fainting is a condition of temporary unconsciousness brought about by interference with the flow of blood to the brain. It is in effect a mild stage of shock or collapse and, as in those conditions, the interference with the cerebral circulation is due to lowered blood pressure.

This may be the result of loss of blood, or of loss of fluid from the blood, as by profuse vomiting or diarrhea, or weakened heart action, or a relaxed condition of the blood-vessels. It will be recalled that the blood has to flow to the brain against gravity and its power to do so is very dependent upon the normal tone or contraction of the blood-vessels, especially that of the small arterioles. Some people, however, faint very readily, even the sight of blood, slight pain, fear, worry, being sufficient to make them do so. Such causes probably act partly through their effect upon the sympathetic nervous system, but, the ways in which sympathetic stimulation induces collapse are not definitely known, especially the relatively mild stimulation induced by such causes as those just mentioned. Ill health is a powerful predisposing cause and also, probably, lack of self-control and self-suggestion; for examples: (1) a person hears someone say that she fainted at the sight of blood and expects to do likewise; (2) a person who faints once may expect to do so again under similar circumstances and, if she does not overcome the belief, is likely to do so.

Symptoms.—Before fainting a person is likely to experience sensations of nausea and faintness and to be conscious of roaring and ringing sounds in the ears, the face becomes pale and sometimes covered with perspiration, the pulse grows relatively weak and rapid, and if the condition is not overcome, unconsciousness supervenes.

Treatment.—The essential feature of the treatment is to facilitate the flow of blood to the brain and, if a person on first feeling faint, bends forward until her head is about on a level with her knees, loss of consciousness may be prevented. If this does not answer, lay her on her back, loosen her clothing and if she is indoors open a window. As soon as consciousness returns ammonia may

be given by inhalation and, preferably the aromatic spirits of ammonia, by mouth. A drink of hot tea may also be given for both the heat and the contained caffeine are stimulant. A cup of coffee will contain more caffeine than one of tea, but the extractives in coffee often cause nausea when there is a tendency to this condition. The patient should be kept quiet and warm in the recumbent position until the sensation of weakness is overcome.

Heat Stroke or Thermic Fever. Heat Exhaustion or Prostration. Sunstroke or Insolation

The injurious effects of prolonged exposure to the intense rays of the sun during hot weather have been observed from early times. At one time the effects of such exposure were diagnosed as apoplexy and palsies and they were attributed to drinking cold water while the body was overheated. Later, in certain tropical lands, it was recognized that the effects were due to the sun's rays, and not to the cold water and still later it was found that artificial heat, as in boiler rooms and factories, was capable of producing the same effects as those sometimes induced by solar heat and that the onset of the disturbance was favored by: (1) conditions that interfered with heat loss, *e. g.*, (a) lack of air movement, either in the open or in badly ventilated buildings; (b) excessive humidity; (c) tight and heavy clothing; (2) lack of covering on the head when exposed to the sun's rays; (3) intense dryness of the atmosphere at high altitudes—the causes under such conditions, it is thought, are (a) the dehydrating effect of the dry atmosphere on the tissues of the body and (b) the disturbing effects of the sun's rays to which the body is more exposed at high altitudes

and when there is little moisture in the atmosphere to absorb these rays; (4) conditions that favor heat production, *e. g.*, muscular exercise; (5) the use of a rich nitrogenous and fatty diet and of alcoholic beverages; (6) conditions that lower the individual's resistant powers, *e. g.*, alcoholism, ill health, fatigue.

Post mortem examinations have shown that apoplexy is not the cause of the symptoms that develop after exposure either to the sun's rays or to artificial heat, for no signs of cerebral hemorrhage have been found. Both the pathological conditions found on post mortem and the symptoms vary somewhat and according to these variations the conditions have recently been classified as heat stroke or thermic fever, heat prostration or heat exhaustion, sunstroke or insolation.

Heat Stroke or Thermic Fever

Heat stroke may follow exposure to excessive heat, either natural or artificial. **The pathological conditions** most frequently found are: (1) congestion of the internal organs, especially, as a rule, the brain and meninges, though in some fatal cases the lungs have been found to be the parts chiefly affected; (2) degenerative changes in some of the internal organs; (3) abnormal fluidity of the blood and (4) diminished alkalescence of the blood.

Various **theories** have been advanced to account for these phenomena, but up to the present none have been proved, it is believed, however, that the symptoms are partly due to (1) depression of nerve centers, especially the heat regulating centers, the centers controlling the heart and breathing, and the vasomotor centers; (2) defective metabolism; and (3) the accumulation of toxic substances in the body.

Symptoms.—The onset may be sudden or preceded by certain prodromal symptoms, such as headache, lassitude, malaise, dizziness, frequent micturition of small amounts of urine, thrist, intense pain in the head and chest, restlessness, and mental excitement. Sometimes, however, the temperature rises rapidly to from 105° to 112° F., or even over, without, or very quickly after the onset of, such symptoms. There may then be a period of delirium, but stupor and unconsciousness soon follow. The skin is hot and generally dry; the face and neck may be intensely red or cyanosed; the conjunctivæ are injected; the pupils either contracted or dilated and insensitive to light; the pulse varies, sometimes it is rapid and full, at others rapid and feeble; the breathing may be either stertorous, deep and labored, or hurried, shallow, and gasping. The muscles are relaxed, but nevertheless spasmodic twitching and convulsive attacks are not uncommon.

The condition may end in recovery or in coma and death, the mortality is generally estimated at 40 per cent. Recovery may be complete but usually there remains a sensitiveness to heat and a tendency to heat prostration on exposure to even moderately high temperatures. In some cases there is a tendency to more or less constant headache and, after severe attacks, there may be permanent impairment of the health and mental faculties and even dementia or insanity.

Treatment.—The objects of the treatment are: To reduce the temperature as quickly as possible, to restore the action of the skin, to prevent cardiac and respiratory failure, and to promote the elimination of toxins. For the reduction of temperature cold baths or packs are given, ice is put on the head and around the neck and, if the temperature is very high, ice is rubbed on the body. Vigorous friction is given during the cold treatment.

The temperature is taken by rectum about every twenty minutes and when it falls to about 102° F. the patient is removed from the bath and wrapped loosely in a cotton blanket, heat is put at the feet and ice on the head. The temperature is taken about every half hour, for it may rise again, in which case the cold bath or pack is renewed. If the pulse shows signs of cardiac weakness, stimulants are given. If the breathing is embarrassed artificial respiration may be necessary and an intravenous infusion of sodium bicarbonate, 1 or 2 per cent., is sometimes given. A cathartic is usually given. It is important that the patient be kept cool and that the air in the room be kept in motion. Careful watch must be kept for symptoms of cardiac or respiratory failure and elevation of temperature.

Heat Prostration or Heat Exhaustion

The terms heat prostration and heat exhaustion are applied to a condition following exposure to either natural or artificial heat in which the symptoms are of a milder type than those typical of heat stroke.

The symptoms are: giddiness, staggering gait, faintness, and nausea; the skin is usually pale and moist, and cool; the pulse small and weak, the breathing shallow, the temperature may be normal, subnormal, or slightly elevated.

Recovery usually occurs in a short time, but occasionally persons debilitated by disease or age pass into coma and die.

The treatment consists in (1) keeping the patient in the recumbent position in a well-ventilated, darkened room; (2) taking means to secure rest and sleep; (3) the application of ice to the head; (4) the administration of mild

stimulants such as aromatic spirits of ammonia by mouth and ammonia by inhalation.

Heat Cramp

Cramps in various groups of the skeletal muscles, especially those of the legs and arms, sometimes follow exposure to intense heat, as in the furnace rooms of steamers and in iron foundries. The cramps may persist for several hours and be followed by soreness and weakness of the affected muscles.

The treatment is the same as for heat exhaustion plus, after the acute symptoms subside, massage of the affected muscles.

Sunstroke or Insolation

The term sunstroke is now commonly restricted to a condition of the shock type following exposure to the sun's rays in hot weather.

It is believed that the characteristic symptoms of this condition are **due chiefly** to the effect of the actinic rays of the sun on the central nervous system, especially the brain. It will be remembered that sun-burn—so-called—is in reality an erythema due to the actinic rays.

Symptoms.—In mild cases the symptoms are similar to those of heat exhaustion, in more severe attacks there is usually a sudden collapse with unconsciousness, cold, clammy skin, pallor, feeble, rapid pulse, labored or shallow breathing, normal or subnormal temperature.

Mild cases usually end in complete recovery, though headache and giddiness may persist for some time. Severe strokes may be followed by acute or chronic meningitis, loss of memory and other signs of mental impairment, even epilepsy or dementia.

The treatment is the same as for heat exhaustion plus the application of heat to the feet and legs and the use of cardiac and respiratory stimulants, an intravenous infusion is sometimes given and, usually, a laxative. Careful watch must be kept for cardiac and respiratory failure. Artificial respiration may be necessary.

Convulsions

The causes and nature of convulsions and the points to be observed as an aid to diagnosis were mentioned in Chapter VIII.

The treatment of convulsions depends to some extent upon their cause. In all cases it is important to see that the patient does not bite her tongue, this is especially likely to occur in epileptic seizures, therefore, if the muscles of the jaws are involved, put something soft, as a folded towel, between the teeth; loosen tight bands, corsets, etc.; do not try to restrain the patient's movements, but see that there is nothing near that she can strike against. In epileptic convulsions it is generally better to leave the patient on the floor, for the convulsive movements are likely to be particularly violent and the patient may fall from a bed or couch. Children are usually put into a hot (106° F.) bath and kept there for from ten to twenty minutes, cold compresses or an ice-cap should be kept on the head during the treatment. If the convulsions are due to digestive disturbances the doctor is likely to prescribe lavage and an enema and later a dose of castor oil. If worms in the intestine are the cause, an anthelmintic enema is usually prescribed. Hot baths or packs are also generally prescribed for adults when the convulsions are due to uremia. In strychnine poisoning and tetanus quiet is exceedingly essential to prevent the

occurrence of convulsions, for even a slight sound, jar of the bed, or other feeble stimulus, may excite a convulsion under such conditions.

Chills

The nature and cause of chills were described in Chapter VIII.

The treatment consists in putting the patient to bed, if she is not already there, wrapping blankets snugly around her, and putting hot-water bags in the bed. If the patient is not nauseated hot drinks are usually given. Remove the blankets and hot-water bags as soon as the patient stops shivering and take her temperature. The temperature should be taken every hour until it ceases to rise. The after treatment depends upon the cause of the chill and the doctor's orders.

An individual experiencing chilly sensations following exposure to cold and wet should have a hot bath, take a hot drink, preferably hot lemonade (*which has a tendency to promote diuresis as well as diaphoresis*), go to bed, and keep well covered. This treatment is to promote diaphoresis and increase the amount of blood in the skin and thus relieve congestion of the respiratory mucous membrane. Such congestion almost invariably follows cooling of the body surface; in a hardy person such congestion usually subsides as soon as the external conditions are changed, but if it fails to do so conditions favorable for the propagation of bacteria are induced and, as some of the varieties or organisms which induce colds are usually present in the nose or mouth, a cold is very likely to result, if means are not taken early to relieve the congestion. Aspirin or other drug that promotes diaphoresis is also usually recommended.

Asphyxia or Suffocation

Asphyxia is due to the inhibition of external or internal respiration. It may be the result of (1) conditions in or around the air passages that prevent the passage of air to the lungs; (2) abnormal conditions of the lungs, including the presence of water in the air-sacs, as occurs in drowning and edema of the lungs; (3) prolonged tonic contraction of the respiratory muscles during convulsions; (4) paralysis of the respiratory muscles; (5) depression of the respiratory center as by drugs; (6) interference with the pulmonary circulation; (7) abnormal conditions of the hemoglobin, *e. g.*, when illuminating gas is inhaled the carbon monoxid combines with the hemoglobin and thus prevents the oxygen doing so; (8) deficiency of hemoglobin, *e. g.*, the venom of certain snakes causes the excessive destruction of erythrocytes (*red corpuscles*) and thus there is a loss of hemoglobin from the blood; (9) acidosis which, for reasons given in Chapter VIII., interferes with internal respiration, *i. e.*, the interchange of oxygen between the blood and other tissues.

Symptoms.—The symptoms of asphyxia are caused by the accumulation of CO_2 in the body; the deficiency of oxygen, and the accumulation of lactic and other acids resulting from the defective oxidation. The central nervous system, especially the respiratory center and the cerebral cortex is extremely sensitive to diminution of the oxygen content of the blood supplying it and to the presence of hydrogen (acid) ions. The first effect is excitation, but this is followed by depression. The consequent symptoms are usually described as being of three phases or degrees. The first phase includes those due to the excitation of the respiratory center and the cerebral

cortex, the second those produced as the stimulation increases and other parts of the brain and the spinal cord become involved, and the third those induced by the exhaustion of the central nervous system and the heart.

The symptoms of the first phase are rapid breathing, increasing dyspnea and cyanosis, air hunger, and mental excitement; in the second phase these conditions are all increased, there is a great rise of blood pressure and consequent slowing of the heart's action, profuse sweating, contraction of the pupils, bulging of the eyes, and general convulsions; this phase rarely lasts more than a few minutes; the symptoms of the third phase are those of collapse.

Treatment.—The cause must be removed if possible, artificial respiration given if necessary, and the usual means must be taken to prevent collapse. When the condition is due to abnormal conditions of the blood phlebotomy is sometimes performed and followed by an intravenous infusion or transfusion.

The reason for the withdrawal of blood and its replacement with a saline solution is that some of the poison is removed with the blood and the introduction of the saline is followed by stimulation of the blood-forming mechanisms to the rapid production of new corpuscles.

Drowning

Drowning is a condition of asphyxia due to filling of the air-passage and alveoli with water which prevents the entrance of air into the alveoli.

Treatment.—Loosen the clothing as quickly as possible. See if the nose or mouth is blocked with mud, sea-weed, etc., and if so remove the obstruction. Pull the tongue forward if it has fallen backward and, if

necessary to keep it so, tie something, as a handkerchief, around it and tie the ends of the latter at the back of the neck. As speedily as possible turn the person face downward, put your hands under the upper part of the abdomen and raise this portion of the body (*this helps to*

Fig. 121. Emptying water from the lungs.

get some of the water from the lungs). Lower the body and begin artificial respiration. The Schaefer method is generally considered the best one to use after drowning for it favors the expulsion of water from the lungs and, when the patient is prone, the tongue does not tend to fall back over the larynx as it does in the dorsal position. Hope of recovery should not be abandoned for at least two hours. Something dry should be put over the patient until it is possible to remove the wet clothing for, if the latter is covered, evaporation will proceed less rapidly and consequent chilling of the body will be retarded. As soon as possible the wet clothing should be removed and the patient wrapped in dry blankets or suitable substitutes and surrounded with hot bottles or substitutes.

Contusions or Bruises

A contusion consists of crushing of the tissues associated with the escape of blood from capillaries in the area, but without, unless complicated with a wound, breaks in the skin. The condition is characterized by pain, swelling, and discoloration (*due to the blood free in the tissues*). At first the discoloration is red, later it becomes blue, purple, or black and, as the exudate becomes disintegrated, yellow and greenish.

An accident causing severe bruising may rupture a large vessel, as well as capillaries, and, in such case, a subcutaneous hemorrhage with the formation of what is known as a *hematoma* or *blood tumor*, due to the collection of blood under the skin.

An important point to remember regarding contusions is that the tissue may be greatly devitalized by the injury and thus rendered a fallow ground for bacteria. Therefore the part should be gently cleansed with hot water and soap. If there are any breaks in the skin iodine should be applied over and around these before the washing.

Treatment.—Except under the conditions mentioned later, the usual treatment consists in, as soon as the cleansing process is completed, elevating the part and covering it with compresses moistened with an iced antiseptic solution. Either lead and opium, aluminium acetate, or vinegar is a good liquid to use for the purpose, since, being astringent, they tend to contract the tissue and thereby check bleeding and lessen pain. After a short time the part is usually bandaged for the pressure of the bandage helps to prevent further escape of blood and hastens the absorption of that already shed. The material used for the bandage should be of a nature to allow the ready penetration of the liquid to the com-

presses, this, after the bandage is applied can be poured over the part or squirted from a syringe. Sometimes an ice-cap is used instead of, or in addition to, the compresses.

If the contusion is very severe, especially in the case of the aged or very young, hot compresses are used instead of cold, since, if the tissues are greatly devitalized, they may not be able to withstand the depressant effect of the cold.

The usual treatment for contusions around an eye is to cover the part with cold or, if necessary, hot applications and adjust a firm bandage. Compresses wet in boric acid solution, 4 per cent., are often used for the purpose. If, as soon as injury is sustained, ice is held over the eye for a time the swelling and discoloration may be prevented.

Fractures

A fracture is usually defined as "a break in a bone." **Fractures are usually the result of** falls or blows, occasionally they are produced by violent muscular contractions, as during convulsions.

Terms used in describing the more common types of fractures.—Greenstick fracture—this type is common in infancy and early childhood, while the inorganic matter is relatively scant. In this form the bone is bent and split, but not broken through. It is so called because it resembles the result of endeavor to break the green twigs of trees, etc. **Epiphyseal fracture**—this is a break in an epiphysis or at the union of an epiphysis with the shaft of a bone (*it will be recalled that* (*1*) *until growth in the long bones ceases, there is always a line of cartilage between the ends of the bone and the shaft due to the cartilage growth*

outspeeding ossification and (2) the portions of the bone separated from the shaft are known as epiphyses). This forms a relatively weak point in a long bone and thus is one of the most common locations of fractures in youth, up to about the eighteenth year. **Simple or uncomplicated fracture**—this is a break in a bone that is not complicated with splintering of the bone or injury to other tissues further than the amount of local bruising inevitably associated with such an injury. **Complicated fracture**—this is a break associated with other injuries, as hemorrhage, sprain, dislocation, injury to the nerves, etc. **Compound fracture**—in this type the tissues above the seat of fracture are torn and injured in a manner to allow communication between the latter and the exterior. **Comminuted fracture**—in this type the bone is splintered at the seat of fracture. **Multiple fracture**—in this form there is more than one break, but the lines of fracture do not communicate with each other. **Impacted fracture**—this is a break in which one fragment is driven firmly into the other. **Partial fracture**—in this type the break is not complete, *i. e.*, it does not extend entirely across the bone, when it does the fracture is said to be complete. **According to the direction of the break a fracture is said to be** transverse, oblique, spiral, etc. **Colles' fracture**—this is a break in the lower part of the radius. **Pott's fracture**—this is a break in the lower part of the fibula with serious injury of the lower tibial articulation, usually a chipping of a portion of the inner malleolus or rupture of the internal lateral ligament.

Repair of fractures.—When a bone is fractured there is always more or less contusion and laceration of the soft tissues in the vicinity and of the periosteum and endosteum. As a result blood escapes from the small vessels in the part and clots form around the fractured ends.

Also there is congestion of the vessels in the area and a large number of white corpuscles pass from the vessels into the tissues. These disintegrate and demolish the blood clots. As soon as the corpuscles have cleared away enough of the débris to make conditions favorable, the cells around the torn edges of the periosteum and endosteum and those of the marrow begin to multiply and they produce a gelatinous intercellular substance which is known as callus. This sticks the severed edges together. While this new connective tissue is being formed the cells on the edges of the injured blood-vessels are proliferating and multiplying and forming new branches that penetrate into the new tissue and thus provide it with building material. The osteoblasts (*the bone cells*) take no part in the preliminary stages of repair, but the latter are associated with more or less osteitis (*inflammation of bone tissue*) and some of the osteoblasts in the lacunæ are set free and these then proliferate and secrete callus that is gradually converted into bone tissue by the deposition of mineral matter. There is usually an excessive amount of callus formed so that for a varying length of time after the bone heals there is a lump around the part. However, the external callus, that produced by the cells of the periosteum, is gradually absorbed after the healing process is completed and, except when there has been a great excess formed, especially of that made by the osteoblasts, the deformity subsides. **Common causes of excess callus formation are:** (1) extreme laceration of the periosteum and surrounding parts and the consequent stimulation of a large number of cells to reproduction; (2) comminuted fractures; (3) extreme osteitis, both of these conditions cause the liberation of a large number of osteoblasts; (4) too early use of the fractured part and consequent tearing of the callus, which

induces the proliferation of extra cells. Sometimes **a fractured bone fails temporarily or permanently to unite** or is joined only by fibrous tissue. Common causes of this are: improper reduction of the fracture, infection of the bone or surrounding tissues; general ill health, especially in diseases such as diabetes, rickets, and syphilis; pregnancy.

Symptoms.—The usual symptoms of fracture are: pain, swelling, discoloration, deformity, abnormal motion, loss of power, and crepitus, *i. e.*, the sound elicited when the two ends of a severed bone rub upon each other. This and abnormal motility are two positive signs of fracture, but naturally they must never be sought for by nurses, in fact, when X-ray examination can be procured, even the surgeon does little to elicit these symptoms. Loss of power is not always evident, either because of the situation of the bone or because the bones are in pairs, *e. g.*, the tibia and fibula, the radius and ulna, in such case the uninjured bone acts as a splint or support for the other; people have sometimes walked quite a distance after fracture of one of the bones of the leg.

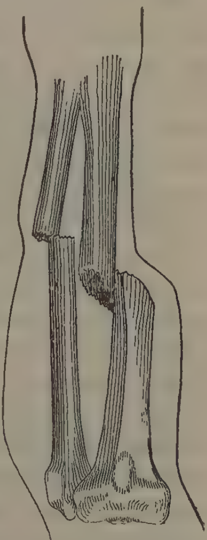


Fig. 122. Showing displacement of bones in a fracture.

Fracture of certain bones may give rise to special symptoms as the result of injury to, or pressure upon, the underlying tissues, *e. g.*, in **fracture of a rib** there is difficulty in breathing and, if the injury to the lung is at all extensive, frothy blood may be spit up and there may be an escape of air from the injured portion of the lung into

the tissues at the point of injury, this constitutes a type of emphysema. When this condition exists a sharp crackling sensation is perceived if the finger is drawn over the affected portion of the chest. **Fracture of the skull** may cause various symptoms, depending upon the location, as the result of pressure upon the brain by fragments of bone or blood clots. Common ones are slow pulse, headache, and mental dullness or unconsciousness; if the fracture is at the base there is likely to be bleeding from the ear and, later, a serous discharge; if a motor area is involved there may be twitching or paralysis of the part it controls; if a center or nerves controlling one of the eyes is affected there will be inequality of the pupils and other eye defects. If a **fractured vertebra** presses upon the spinal cord, there will soon be paralysis and loss of sensation in the parts below the break.

Treatment.—The most important considerations in the first aid treatment of fractures are measures to obviate danger of (1) the sharp edges of the severed bone injuring the surrounding tissues; (2) shock; (3) in a compound fracture, infection.

Carelessness in moving a fractured part or allowing a fractured limb to remain in a bent position or dangling **favors injury of the nerves, blood-vessels and soft tissues in the area** by the sharp fragments of bone, these may even protrude through the flesh and thereby cause the conditions of a compound fracture which always retards the union of the bone and exposes the individual to serious infection. Injury to the soft tissues may also be caused by muscular contractions pulling upon the lower fragment, the contractions are caused by irritation at the point of fracture and are likely to be increased by moving or handling the part before a splint is applied. This is especially likely to occur in fractures of the femur

and humerus where there is no companion bone to restrain the movements of the injured one.

Therefore, sending for a surgeon and, for a fractured limb, immobilization of the part with splints are usually the two first things to be considered. Almost anything stiff and of sufficient length, either singly or by being tied together, to support the part and immobilize the joints above and below the point of fracture can be used

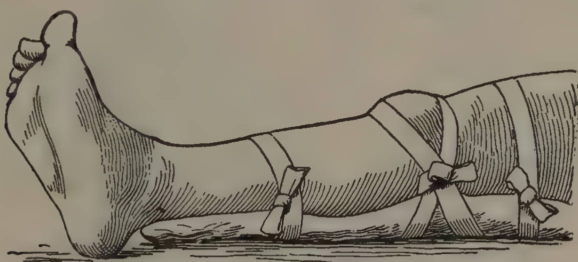


Fig. 123. An emergency splint for the leg.

for a temporary splint, *e. g.*, umbrellas, canes, or branches of trees tied together. If the fracture is in the forearm, after something to immobilize it is applied, a sling should be improvised. For fracture of the humerus, in addition to the splint and sling, it is well to put some kind of a band around the arm and chest in a manner to steady and support the former. For fracture of the clavicle the forearm should be put in a sling, for, if it is allowed to hang, there will be a pull on the broken bone that will increase the pain and may injure the tissues. Even after a splint has been applied, a person with a fractured leg should not be allowed to walk. For fracture of the femur or a bone of the trunk or skull the early attendance of a surgeon is especially important and, unless the location of the accident makes it necessary, it is better not to move

the patient until he comes. When the skull is fractured the head should be kept slightly elevated. If a rib is fractured a band should be pinned or tied over it and around the lower part of the chest to restrict the breath-

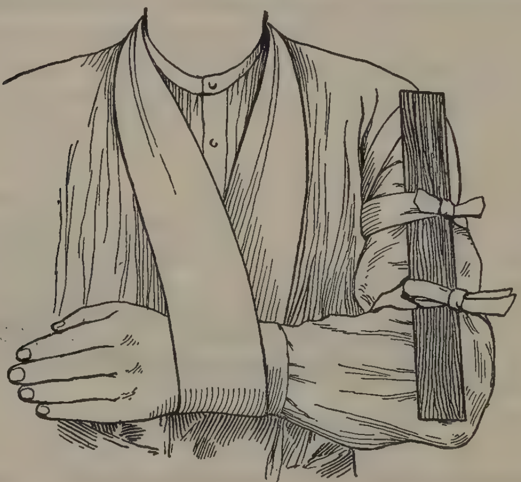


Fig. 124. Temporary splint for the arm.

ing movements. If a person with a fractured femur has to be moved, something that will serve as a splint should be tied along the outer surface of the thigh and leg and another splint under these parts, or at least under the point of fracture, and this must be passed into place with the least possible movement of the thigh. For fracture of the pelvis the knees are tied together to prevent movement of the legs and consequent dragging upon the injured bone.

The special after treatment of fractures consists chiefly in (1) reducing the fracture, *i. e.*, getting the parts of the severed bone into apposition and (2) immobilizing the

part with splints, or in the case of the ribs and fixed bones, such as those of the nose, adhesive plaster, or, (3) especially in the case of the femur or humerus, the use of apparatus to cause traction and suspension. Operative measures to remove blood clots or fragments of bone causing pressure are likely to be necessary for fracture of the skull and of the vertebræ and should be performed as soon as possible.

Even if a surgeon cannot get to the patient for two or three days, an incompetent person should not attempt to reduce a fracture, but should take means to keep the injured part perfectly quiet on a firm flat surface and covered with an ice-cap or iced compresses in order to inhibit pain and congestion and consequent swelling of the part.

Dislocations

A dislocation is an injury in which one of the bones of a joint is out of its socket. It is associated with stretching and usually tearing of the ligaments that normally hold the bone in place. **A dislocation may be caused by** a fall or blow or by strain due to a forcible movement. The joints most subject to dislocation are the shoulder, hip, lower jaw, and those of the fingers and thumb.

Symptoms.—Deformity, due to the misplaced bone, severe pain, inability to move the joint properly, and usually swelling and discoloration of the surrounding parts. The jaw bone and bones of the fingers are relatively easily put back into place and therefore, if a great length of time must elapse before a surgeon can reach the patient, it is permissible for a nurse to perform the operation, especially to put the jaw bone into place for, when this joint is dislocated, the mouth cannot be closed

and the pain is extreme. No attempt however should be made to put a bone of a large joint into place, even if it is necessary to wait a day or two for a surgeon, for incompetent manipulation is likely to result in severe injury to the surrounding tissues which will make it more difficult for a surgeon to get good results and may cause permanent deformity and lack of mobility. Therefore, the first aid treatment for a dislocation is the same as that of fractures, viz., to immobilize the part with a splint, sling, or bandage, keep the patient quiet, and apply cold over the injured area.

To reduce a dislocation of the jaw.—Have the patient sit upright with a firm support at the back of her head; put a compress or several layers of bandage or other protector around your thumbs, place them, one on each side, on the patient's back teeth, put your fingers under and behind the jaw, as shown in Fig. 125, and then press downward and backward while, at the same time, you push the chin upward. Be prepared to remove your thumbs the instant the jaw moves, because it is likely to snap into place suddenly, it is for this reason that the thumbs are protected. When the jaw is in place support it with a bandage such as shown in Fig. 85.

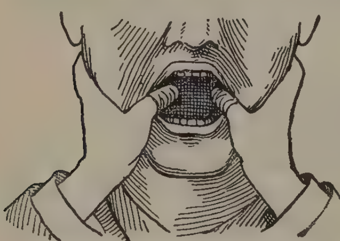


Fig. 125. Method of reducing a dislocated jaw.

To reduce a dislocation of the fingers or thumb, make gentle traction (pulling) on the finger or thumb and at the same time with the other hand move the bone into its proper position. Bandage a small splint to the front of the finger and hand.

If a joint remains stiff after the acute stage has subsided local hot air baths and massage are generally prescribed.

Sprains

A sprain is an injury to a joint consisting of more or less twisting or wrenching and sometimes tearing of the tendons and ligaments, but, unless the sprain is complicated by a fracture or dislocation, there is no break or displacement of a bone.

Sprains are caused by unnatural movements of a joint and occur most frequently in the ankle.

Symptoms.—Intense pain which is increased by motion, swelling, more or less interference with movement of the joint, and usually discoloration of the part. It will be noticed that the only symptoms of a fracture that are lacking in a sprain are those which only a surgeon should seek for or even be likely to recognize. Therefore, if the pain and swelling are extreme the first aid treatment should be that of a fracture.

The usual treatment for a sprain consists in keeping the part slightly elevated and covered with hot or cold applications until the pain and swelling subside somewhat, massage is then generally prescribed and a bandage, adhesive strapping, or splint applied. As a rule, after a few hours, a slight amount of exercise is allowed. Daily massage and a hot air bath are commonly prescribed if there is subsequent stiffness of the joint.

Hemorrhage

As previously stated, **hemorrhage signifies** profuse bleeding.

The causes, types, and symptoms of hemorrhage were described in Chapter VIII.

The body is provided with certain natural resources that are of great help in controlling hemorrhage, namely: (1) The elastic nature of the blood-vessels which, when vessels are severed, causes them to contract and thereby reduces the size of the openings; (2) the blood tends to coagulate as soon as it comes in contact with air or the tissues or other foreign substance such as the dressing of a wound, and the clots block the openings; (3) the heart action is weakened as soon as there has been any considerable loss of blood and less blood is then sent through the vessels.

First aid treatment.—The important procedures for nurses to use to control hemorrhage are to (1) keep the patient quiet; (2) put the bleeding part in a position that will retard the flow of blood to it; (3) apply pressure when possible; (4) sometimes, use astringents or styptics; (5) in some cases, use hot or cold applications. In addition to these measures **the surgeon may resort to ligation** (*tying the vessels*), torsion (*twisting the vessels*), suturing (*sewing*), use of the cautery.

Quiet, mental and physical, is most important, for movement and excitement increase the rate and force of the heart's action. Therefore it is imperative to reassure the patient and morphine is commonly prescribed because it tends to dull the perceptions and lessen worry, nervousness, and restlessness.

Position.—Naturally the position that is best suited to check hemorrhage is that which requires the blood to flow to the part against gravity, therefore the bleeding part is to be elevated above the heart. When the injured area cannot, like the limbs, be raised, the desired position is secured by changing the position of the bed, *i. e.*, for

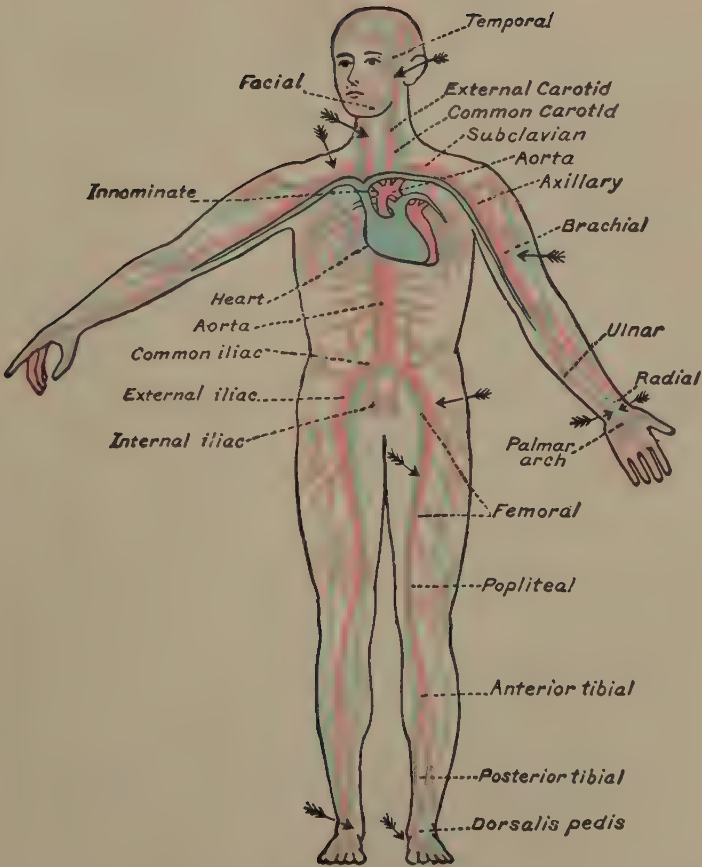


FIG. 126.—DIAGRAM SHOWING PLAN OF DISTRIBUTION OF ARTERIES AND VEINS THE ARROWS INDICATE THE POINTS WHERE PRESSURE MAY BEST BE APPLIED.

abdominal hemorrhage the foot of the bed is raised, for hemorrhage in parts above the heart the head of the bed is raised.

Pressure.—Pressure may be either direct or indirect, *i. e.*, it may be made directly upon the bleeding vessels or (indirectly) upon the main vessel through which the blood reaches the injured area.

Whenever possible **direct pressure** is used because bleeding is generally more easily controlled in this way, especially if there is a bone behind the bleeding point, frequently, however, the direct method cannot be used, the two most common reasons being that (1) the bleeding vessels are not in a location that can be reached; (2) lack of means of being asceptic, which would entail danger of causing infection were pressure made in the wound.

To make direct pressure either put on a sterile glove and make pressure with a finger upon the bleeding vessels or, with sterile forceps or, if these are not to be had, with the gloved hand, pack the wound tightly with sterile gauze and press the latter firmly upon the bleeding point. Maintain the pressure until a surgeon comes or, if the bleeding ceases, apply a sterile dressing and bandage it firmly in place. Even though the bleeding ceases the patient should not be left alone until a surgeon has taken the necessary precautions to avoid recurrence of the hemorrhage, for the slightest movement, even excitement, may dislodge the clots arresting the escape of blood from the vessels.

If there is nothing sterile at hand indirect pressure must be made until sterile supplies can be obtained. In emergency, clean soft muslin thoroughly pressed with a very hot iron can be used as a substitute for gauze and blunt scissors can be used for forceps.

Indirect pressure may be made with the fingers (**digital pressure**) or, on the limbs, with a tourniquet. When the hemorrhage is from an artery the pressure must be made between the heart and the bleeding point, when it is from a vein pressure may also be necessary between the bleeding point and the periphery to prevent the escape of the blood that is already in the veins. In emergency a handkerchief, or a strip of muslin or any fairly strong material, and a stick and stone or similar objects can be utilized for a tourniquet.

Fig. 127. Method of making digital compression.

To use such an improvised tourniquet put the stone in the center of the handkerchief and this over the artery supplying the bleeding vessels, tie the material as shown in Fig. 128, place the stick over the knot, tie it in place, and then twist the stick until the bleeding ceases.

Fig. 128. Improvised tourniquet mad: with a handkerchief, stick, and stone.

The places on which to make pressure with the fingers or stone are shown in Fig. 126 and the following table:

To arrest bleeding from:	*Make pressure on:*
The scalp	The temporal arteries.
The face	The facial artery on the side of the bleeding.

To arrest bleeding from:	*Make pressure on:*
The neck	The carotid artery on the side of the bleeding.
The shoulder or axilla	The subclavian artery.
The arm	The brachial artery.
The wrist or hand	Either the brachial or the radial and ulnar arteries.
The thigh	The femoral artery at either of the points indicated in Fig. 126. These points are (1) where the artery passes over the brim of the pelvis, viz., at about two-thirds of the distance from the hip bone to the middle line of the body; (2) Scarpa's triangle which is at the inner aspect of the thigh, at about the lower border of the upper third of its length.
The leg or foot	Either on the femoral artery, as for the thigh, or on the popliteal artery, by flexing the leg on a pad, as shown in Fig. 129, or on the tibial artery.

A very important point to remember in connection with indirect pressure is that it cannot be continued for more than an hour without danger of causing gangrene (death of the tissue) in the part that is deprived of blood. Therefore, it is most important to get a surgeon and sterile supplies as quickly as possible. If a surgeon does not arrive at the end of an hour the pressure must be released, very slowly, sufficiently to allow the blood to flow into the part; if bleeding starts again, the pressure must be resumed after a few minutes, but it must be released for at least a minute or two about every half hour until help arrives. As soon as sterile supplies are obtained pack the wound and apply a tight bandage, then, with the part in the proper position, as previously described, release the pressure to some degree, but very

slowly, so as not to risk dislodging clots by a rush of blood.

Hemorrhage from parts below the elbow or knee if not severe, can usually be easily controlled by placing a thick

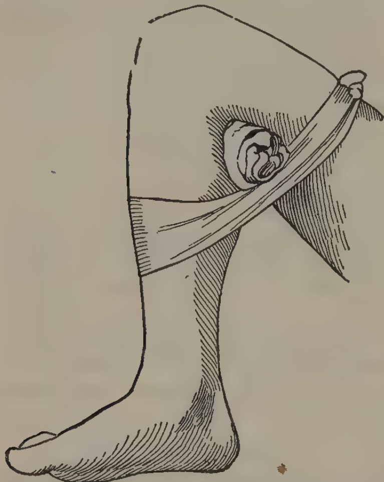


Fig. 129. Forced flexion of the knee to arrest hemorrhage in parts below it.

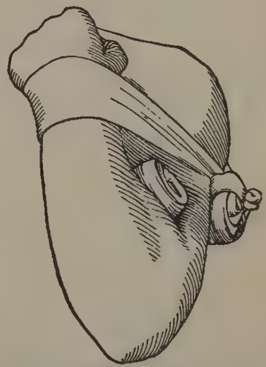


Fig. 130. Forced flexion of the elbow to arrest hemorrhage in the forearm or hand.

wad, of soft, but tightly rolled, material in the bend of the joint as shown in Figs. 129 and 130 and holding the arm or leg in position either with the hand or a bandage.

Astringents and styptics.—Astringents are drugs that cause the contraction of tissues, when used to check hemorrhage the stronger ones are classed as styptics. The more commonly used astringents are: adrenaline, tannin (*tea leaves contain tannin and a strong decoction—made by boiling the leaves—is a common way of using*

tannin in emergency), and dilute acetic acid (*vinegar usually contains up to about 6 per cent. acetic acid and may be used in emergency*). Acetic acid is very commonly added to hot douches to check hemorrhage from the uterus, tannin and adrenaline are sometimes used to check nose bleeding and bleeding from the gums and tonsils. The stronger styptics, ferric chlorid, ferric sulphate, silver nitrate, etc., have a strong coagulant effect upon protein and thereby, not only cause the contraction of the blood-vessels at the point to which they are applied, but coagulate the blood and form a thickened mass of the tissue in the area. They are sometimes used when other means fail to check bleeding in such locations as around the navel in the new-born and in cavities left after the extraction of teeth and after tonsillectomy.

Cold and heat.—As stated in Chapter IX. cold contracts tissue and it will contract the blood-vessels both at the area of its application and, reflexly, those in the deep-seated organs below the area. Therefore ice-caps and ice-coils are used to control hemorrhage in the viscera and subcutaneous tissues and crushed ice is sometimes given by mouth to help check hemorrhage from the stomach. An important point to remember regarding the use of ice-caps, etc. to check bleeding is that they must be kept constantly cold, for the reaction effects that follow the discontinuance of the cold would be likely to increase the hemorrhage if they occurred too early. Solutions with a temperature of 120° F. or over, coming in contact with bleeding vessels will further their contraction and (only very slightly at 120° F.) the coagulation of the blood issuing from them. Therefore hot (120° F.) irrigations are used to check hemorrhage from such parts as the uterus and nose. The temperature of the solution must be ascertained with a thermometer, for if it is above

120° F. it will be likely to burn the parts and if cooler it will be worse than useless because more moderate temperatures relax tissue, and thus favor bleeding, and have absolutely no coagulant effect. An astringent is generally used for the solution in order to further the effects of heat since the highest temperature that can be used without danger of burning has only a slight contractile and almost no coagulant effect, though higher temperatures have these properties to a marked degree.

Hemorrhage from the umbilical cord and navel.—Hemorrhage from the umbilical cord is usually due to inefficient tying of the cord, but both from the cord and navel it may be occasioned by a hemorrhagic diathesis (hemophilia) and it is then very difficult to control, in fact a continuous oozing until death occurs is a not uncommon outcome. If hemorrhage from the cord occurs, a sterile ligature is tied around it and, if the hemorrhage is due to insecure ligation, it will then cease, otherwise the doctor must be notified at once. The usual treatment consists in the application of styptics to the bleeding point and compresses moistened with an astringent are bandaged firmly over the part. If these means are not effectual the transfusion of blood or the intravenous injection of drugs that increase the coagulable property of the blood is usually resorted to.

Epistaxis or nose-bleed.—Though bleeding from the nose is usually of capillary origin it may be exceedingly profuse because of the great vascularity of the membrane lining the nasal cavities. It may be due to (1) local injury or disease; (2) congestion resulting from (a) conditions that interfere with the venous flow, such as heart disease, (b) general infections, of these typhoid fever is the one most commonly responsible; (3) abnormal conditions of the blood, as in hemophilia; (4) some individuals.

for no discoverable reason, have an unusual tendency to epistaxis and anything that increases blood pressure, *e. g.*, excitement, may induce an attack. In the **treatment** the first thing to be considered is position, on no account must the individual lean forward, but should sit upright, since this position is least advantageous for the flow of blood to the head and the most favorable one for the venous flow. The application of ice over the nose and at the back of the neck and compression of the nostrils will usually check the bleeding, if it does not spraying the nasal cavities with hot or iced tannin solution (boiled tea can be used) or adrenaline, or plugging them with gauze or cotton moistened with such astringents may be effectual. If these means are not successful a doctor should be notified as it will probably be necessary to plug the posterior nares.

Hemorrhage after the extraction of a tooth.—Place a tight wad of gauze or cotton in the cavity and have the patient close the teeth of the other jaw tightly upon it. If the hemorrhage is not checked moisten a fresh plug with vinegar or tannin solution and use it in the same manner, or substitute a small piece of ice for the plug. If the bleeding is not checked by these means a dentist or doctor should be consulted.

Hemoptysis.—This term is derived from two Greek words signifying to spit blood. It is applied to hemorrhage from the lungs and air passages leading from them. Hemorrhage from the lungs and lower portion of the respiratory tract is usually easily recognized for the blood is frothy owing to its mixture with air. The most common causes are tuberculosis, cancer, gangrene, injury to the lungs by a fractured rib, rupture of an aneurysm into the lungs. The treatment is the same as that for hemorrhage from other internal organs.

Hematemesis.—This means vomiting blood. Seemingly vomited blood may be from any part of the alimentary tract above the pylorus or from the respiratory tract, but from the latter source it is, as previously stated, known as hemoptysis. Very frequently some of the blood escaping from the lungs, etc., or the nose during epistaxis, is swallowed and then vomited later. Blood from the stomach is darker than that from the lungs and, unless vomited immediately after the occurrence of the hemorrhage, it is likely to be at least partly digested in which case some of it will have the appearance of coffee grounds, also that not digested is likely to be more or less clotted. The more common causes of hemorrhage from the stomach are: ulcer, carcinoma, erosion by corrosive drugs, trauma, congestion of the gastric veins due to cirrhosis of the liver which interferes with the portal circulation (*many of the gastric veins, it will be recalled, empty into the portal vein*), abnormal conditions of the blood, as in hemophilia.

Entorrhagia.—Hemorrhage from the intestines or entorrhagia is caused by conditions in the intestine similar to those which, in the stomach, cause hematemesis.

Hematuria.—This term signifies blood in the urine. The blood may come from any part of the urinary tract. Hemorrhage from the urinary organs may be due to local disease, erosion by corrosive drugs eliminated by the kidneys, or the constitutional conditions causing hemorrhage from other mucous membranes.

Uterine hemorrhage.—Hemorrhage from the uterus is most commonly due to (1) the presence of tumors, especially cancer; (2) either local or systemic conditions that cause intense congestion of the uterine vessels; (3) abnormal position of the placenta during pregnancy; (4) following parturition. Uterine hemorrhage following childbirth is known as *post-partum hemorrhage.*

Hemorrhage from cerebral vessels is described under Apoplexy, Section III.

The first aid treatment for hemorrhage from any of the internal organs includes: (1) keeping the patient perfectly quiet and, as previously stated, morphine is generally prescribed to aid in doing so; (2) except for cerebral hemorrhage, raising the foot of the bed so as to keep as much blood as possible in the heart, lungs, and brain and to have the affected organ higher than the heart so that the flow of blood to it will be retarded; (3) applying cold to the area above the organ; (4) surrounding the body with heat to lessen the tendency to shock; (5) sometimes; when the hemorrhage is profuse and difficult to check, the limbs are bandaged in a manner to reduce the amount of blood in the general circulation which tends to lessen the flow of blood from the bleeding vessels; before bandaging a limb for this purpose it is lowered so that the amount of blood in it will be increased and the bandage is started at its upper end; as a rule one limb is left unbandaged and the bandages are changed alternately so that no limb will be left bandaged longer than three quarters of an hour, since to interfere with the circulation in a part for a longer time might injure the tissues; (6) ergot is often prescribed, especially for uterine hemorrhage.

Hot astringent douches are used for **uterine hemorrhage** and, after childbirth, the uterus is kneaded through the abdominal wall to further its contraction. In severe cases of **uterine hemorrhage** the uterus is packed with gauze or tampons, but, except in extreme emergency, this should not be done by a nurse, she should however see that the requisites for the packing are obtained for the doctor. Crushed ice is generally given by mouth for hemorrhage from the **stomach** and also for hemorrhage

from the **lungs** as it is thought that it may induce reflexes that will aid in the contraction of the pulmonary vessels.

Treatment Used to Overcome the Effects of Hemorrhage on the System

Measures commonly employed to overcome the effects of loss of blood from either external or internal parts are: (1) the transfusion of blood or an intravenous infusion of such solutions as normal salt, Locke-Ringer, or gum-glucose; (2) bandaging the extremities so that blood will be more abundantly supplied to the brain, heart, and lungs, which are the parts most deleteriously affected by its reduction. When bandaging the extremities for this purpose the limb is first raised and the bandage applied from the periphery upward. One limb is left unbandaged and the bandages are changed alternately so that no limb is left bandaged longer than three quarters of an hour. (3) The patient must be kept quiet and warm until all evidence of shock is overcome. (4) After hemorrhage from the stomach or intestines no food is given by mouth until ordered by the doctor; but following hemorrhage from any part of the body it is important that, as soon as possible, the patient be given a nutritious diet containing foods with a relatively high content of iron and tonics containing iron are generally prescribed.

Demonstration 103

First Aid Treatment of Individuals Rescued from Drowning. Of Fractures and Hemorrhage. Lifting an Injured Person from the Ground

Requisites.—Articles that could be found and used for splints, bandages, and tourniquets under different circumstances, as in the woods or a country home.

Procedure.—Some of the pupils should lie on the floor and others treat them as though rescued from drowning, or for fractures and hemorrhage. The treatment should include that for shock.

To lift an injured person from the ground.—Two pupils crouch by the patient, on the same side, your feet planted firmly on the floor, your knees bent sufficiently to make you low enough to pass your arms readily under the patient. If the latter is supposed to have fracture of the skull let the taller of the two lifters be the one to support the head, but for the subject in shock let the shorter of the two take the head. In lifting the subject with a supposed fracture be sure that the fractured part is well supported. As usual, one lifter is to give directions. Be sure that your skirts will not be in your way when you rise. Let the lifter at the head pass one of her arms under the patient's shoulders to the further armpit, and the other under the small of the back, while the other lifter passes one of her arms under the patient's hips and the other under her knees. At word from the director, lift the patient onto your knees. Readjust your hold, make sure that there is nothing in your way and, following the directions given in Chapter V, carry the patient to a bed.

Fire

Demonstration 104

Extinguishing Fire

Requisites.—Blankets or substitutes and, if possible, different varieties of fire extinguishers.

Much unnecessary suffering, loss of life, and destruction of property is constantly occurring because people

do not do the right things when a fire starts. **To realize what should be done both to put out fires and to escape from fires and their consequences the following facts should be known:**

1. Burning consists in the union of oxygen with matter and, therefore, if air is excluded from burning material the fire will be extinguished. Air can be excluded by pressing something hard, as a piece of board, or thick and soft, that will envelop the burning object *closely*, *e. g.*, rugs or blankets, **tightly** upon the burning material, or by covering the latter with carbon dioxid, which is heavier than air and therefore does not diffuse readily. This is what is done when the majority of fire extinguishers are used, for these contain chemicals that interact when poured over the flames and liberate carbon dioxid.

2. Movement of air, such as is created by a draft or a person running, favors the spread of fire; it will also hasten the diffusion of the carbon dioxid poured over a flame.

3. Wet material, provided the moisture is not due to an inflammable substance, as ether or oils, has a much higher kindling temperature than dry and will not take fire readily.

4. Many of the deaths that occur when people are trapped by fire, especially in crowded buildings, are due to asphyxia caused by the inhalation of smoke. As smoke is lighter than air it rises, therefore, there is practically no smoke within about six inches of the floor.

5. Another common cause of death following accidents due to fire is shock, and death from this cause has often occurred when there has been relatively little external injury. Probably the chief reason for this is that the intense terror experienced is conducive to shock, but

also creates excitement, which retards the onset of the conditions constituting shock, but increases their intensity later as previously explained.

Procedure in putting out a fire.—If anything in the room catches fire, *at once* bang something hard upon it or envelop it tightly in a rug, heavy coat, blanket or the like. If this is not effectual shut the doors and windows (to prevent a draft); send someone to summon the fire brigade and, if possible, get and use a fire extinguisher, otherwise, except when the flame is due to burning oil, get water and pour it over the flaming material. Water should not be used to extinguish burning oil, for it will not do so and, as oil floats on water, it will spread the flame. Good things to use to extinguish burning oil are the fire extinguisher, clay, sand, ashes or wet blankets pressed tightly upon the burning mass.

To avoid becoming asphyxiated when surrounded with smoke tie something, wet if possible, over the nose and mouth and, if there is much smoke, crawl to safety on your hands and knees, keeping your face near the floor. Try to make others do likewise and do not get excited.

If your clothes catch fire, do not run for help, because this will favor the spread of the flames, but, if the ignited area is small, immediately make hard pressure against it with something hard, as wood or the wall, if this is not at once effectual lie down on the floor and draw the rug tightly around you, or, if there is no rug, anything that can be used as a substitute (*e. g.*, bedclothes, or a heavy coat, or blanket) and if, when lying still, you do not press on a sufficient area to smother all the flames, roll slowly on the floor in such a manner that you will press upon all the burning parts. It is most important to lie down because, as the flames and smoke rise, the fire will spread

over your clothing more rapidly when you are in the erect position.

If anybody else's clothing catches fire help or force her to carry out the preceding directions.

When enveloping a person in a blanket, etc., or when drawing one around yourself, put it first between the flames and the face, otherwise, you are likely to fan the flame toward the latter.

Procedure.—Some of the pupils should pretend that their clothes are on fire and others put the preceding instruction into effect.

Burns. Scalds

A burn is generally defined as a lesion of tissue induced by heat, but similar lesions, also commonly known as burns, are produced by other agents such as the X-rays, the chemical rays of the sun, various chemical substances such as strong acids and alkalies (especially caustic soda and potash and lime) and irritating substances such as mustard and iodine.

According to the degree to which the tissues are injured **a burn is classified** as being of the first, second, or third degree. A burn of the first degree is one in which the skin is reddened, because of slight congestion in its blood-vessels, but is not actually injured. A burn of the second degree is one in which there is inflammation of the skin and blisters. Blisters are due to the exudation of fluid from the congested blood-vessels which raises the outer layer of skin from the underlying tissue. Burns of the third degree are those in which there is charring and destruction of both the skin and deeper tissues.

Burns of the third degree will of course do the most

serious damage to the tissue and function of the affected part; but, so far as the danger resulting from shock and systemic after-effects are concerned, it is not the degree of the burn, but the extent of the skin surface destroyed that is of most importance.

Complications.—Shock is always to be expected when a burn is at all extensive and it is especially likely to occur when the burn is due to the clothing having caught fire, because of the fright associated with such an accident; in fact, shock is one of the most common causes of death following burns. The active cause of the shock, in addition to the fright, probably being the material absorbed from the injured tissue. Other not uncommon causes of death are: pneumonia, due to the irritation of the bronchi and lungs by inhaled smoke; hemorrhage resulting from the sloughing of large blood-vessels; sepsis or inflammation of some of the internal organs, especially the kidneys, due to absorption of purulent material from the lesions. Death from the two causes last mentioned may not take place for several weeks, but it is said that a fatal issue is to be expected if more than one third of the body is burned and almost inevitable if two thirds of the skin surface is destroyed.

First aid treatment.—The only treatment necessary for a small burn of the first or second degree is to cover the part with something clean and non-irritating that will exclude the air and will not adhere to the skin. Examples are: A compress of gauze or soft muslin covered on one side with an emollient such as boric acid ointment, or zinc oxid ointment, or cold cream, or the compress may be saturated with a bland oil (such as olive or linseed oil) or with a solution of sodium bicarbonate (made by dissolving about a teaspoonful of baking soda in a cupful of water). When the solution is used the compress must be

moistened at intervals because the liquid evaporates and the muslin will then stick to the wound.

If a burn is at all extensive a doctor should be sent for at once, if only because of the danger of shock. His arrival, however, must not be awaited to institute treatment for shock and to cover the burns, because the destruction of the skin leaves the nerve-endings exposed and, until they are covered with something that will prevent their stimulation, the pain is likely to be excruciating and this favors shock. Lay the patient at once in the recumbent position, with the head lowered and apply heat as soon as possible. If the burned area is exposed cover it with a dressing at once. If the clothing must be removed to expose the burns be very careful not to break the blisters if such have formed, disturb the patient as little as possible, and, if a large area has been burned expose only a small portion at a time and cover it with a dressing before proceeding. If the clothing sticks to the injured parts moisten it with warm water and cut or rip it up the seams if necessary. Any of the dressings mentioned for a small burn may be used for larger ones until the doctor comes or, if it is part of a limb that is burned it may be immersed in cold water, which not only excludes the air, and thus lessens stimulation, but the cold depresses the sensitiveness of the nerve-endings. Cold, however, should not be applied to a large area for it increases the tendency to shock. The nature of the dressings commonly used in the after treatment of burns was mentioned in Chapter XX. As a rule, blisters are cut to allow of the escape of the serous fluid beneath them, but, unless otherwise ordered by the doctor, this should be done as described under Cantharides, Chapter XVI., and the covering epidermis only removed later as it scales off.

When a large area of the body is burned, instead of covering the lesions with dressings, the patient is kept in a continuous warm bath or hot air bath, as described in Chapter IX.

When a joint is involved, extension may be necessary to prevent permanent contraction. If large areas of skin are destroyed, after the condition of the tissues improve, skin grafting is generally performed, for this hastens healing and lessens deformities.

The treatment for burns due to other agents than heat is the same as for the latter plus, in the case of those due to a chemical, the removal of the substance and, if the chemical is an acid or an alkali, its neutralization. To neutralize an acid, use an alkali, such as a solution of sodium bicarbonate (baking soda) or sodium carbonate (washing soda) diluted ammonia water, lime water, or strong soap suds. For carbolic acid (which is not a true acid) use alcohol. For alkalies use a diluted acid, preferably lemon juice or vinegar. If the neutralizing agent cannot be obtained immediately hold the part under running water, so that the acid or alkali will be diluted and washed off and its action thus minimized, but use the neutralizing agent as soon as possible.

The term scald is applied to an injury due to moist heat. The nature and treatment for scalds are similar to those of burns.

Consequences of Exposure to Cold, Freezing or Frost-bite

Cold depresses living tissue whether vegetable or animal; it lessens the movement of the molecules of which protoplasm is composed, and, thereby, causes contraction of matter and inhibits all vital (life) processes. If the

cold is not excessive, however, or exposure too prolonged, as stated in Chapter IX., cold, by stimulating nerve-endings in the skin, produces conditions that protect the body from its depressant influence. If, however, exposure to intense cold is prolonged, the blood is driven to the interior of the body; the surface of the body becomes stiff, contracted, and pale, especially the more exposed parts and those in which the circulation is first interfered with, namely, the face, hands, and feet. If the exposure continues the circulation of blood in the brain is inhibited and the person becomes drowsy and finally unconscious.

Localized areas, especially parts of the face, hands, and feet may be severely frozen, however, without the onset of symptoms of general depression, especially if the individual is exercising and warmly clad.

In the first stage of freezing the affected part becomes numb and stiff and either a deep red color or blue and mottled due to the damming of the blood in the capillaries as the result of massing of the corpuscles and contraction of the veins. **Later,** as the arterial circulation becomes still further interfered with, the part becomes white and rigid.

Several factors, it is believed, enter into the injury to tissue as the result of frost-bite or freezing, but especially, (1) the deprivation of the tissue of nutrition as the result of the extreme contraction of the blood-vessels; (2) mechanical injury to the surface cells by the expansion of the liquid in and around them when its temperature is reduced below 37° F. (4° C.)—*it will be recalled that though water, like other forms of matter, contracts under the influence of cold, when the temperature just mentioned is reached, it begins to expand;* (3) the congestion and consequent excessive transudation of liquid from the blood-vessels in the area which occurs when treatment is

instituted to restore the circulation. This is thought to be due to (a) injury of the cells composing the walls of the blood-vessels (from the factors already mentioned) which interferes with their normal response to vasomotor impulses; (b) the masses of corpuscles in the small vessels which blocks their lumen. The more rapidly the circulation is restored, the greater the congestion is likely to be and, when it is extreme, the fluid transuding from the blood-vessels may raise the upper layers of epidermis from the underlying tissue and cause blisters. Therefore, if the circulation is restored quickly, the after effects of freezing are likely to be worse than if it is restored slowly. Thus the degree of tissue destruction will depend upon (1) the amount of injury sustained by the cells during the freezing process and (2) the degree of congestion promoted during attempts at restoration. However, even when frost-bite is properly treated, if the primary injury to the cells is extreme, gangrene is likely to result.

The aim of the primary treatment of frost-bite is to restore the circulation in the affected part gradually. Formerly it was customary to rub the part with snow or iced water, but this is not now considered the best treatment: instead, the person is kept in a cool room (about 65° F.) and the frozen area is *very gently* rubbed and, if possible, immersed in water that has a temperature of about 65° F. After a time the temperature of the water is gradually increased, by the addition of slightly warmer water; until it is about 90° F. No definite directions can be given regarding the rate at which the temperature is to be increased, it depends upon the severity of the freezing and the way in which the tissues respond to the treatment: severe freezing and the onset of much congestion require slow increase of temperature. The

frozen part is usually kept elevated as this helps to inhibit congestion. If the frozen area is at all large or if there are symptoms of general ill effects from the exposures, a doctor must be consulted and the patient put to bed and, if necessary, treated for chills and shock, in the usual manner, except that heat must be increased gradually. The hot-water bottles must not be put near the frost-bitten area.

The later treatment of frost-bite depends upon the extent and nature of the lesion produced. If this is small and superficial a dressing such as sterile zinc oxid on gauze is applied loosely around the part and, if there are blisters, a minute puncture is usually made in their lower edge (to allow the escape of fluid) before the dressing is applied. Deeper injury is treated in the same manner as suppurating or necrotic lesions from other causes.

Chilblain

After a part has been frozen, exposure to even a moderate degree of cold is likely to induce a condition similar to the after-effects of freezing in which the part becomes red or mottled and more or less swollen, and is intensely itchy and, especially if the chilled part is warmed quickly, small blisters may form. This condition is known as *chilblain*. People with poor circulation may suffer from chilblain even when the affected part has never been frozen.

To allay the unpleasant sensations induced by chilblain rub the parts with spirits of camphor or alcohol. Denatured alcohol (that containing substances which make it poisonous to drink) can be used for this purpose, the poisons employed not being harmful to the skin.

Removal of Foreign Bodies from the Eyes

Nature has provided the eyes with three very effective means of protection from injury by foreign substances; these are the eyelids, eyelashes, and the secretion of the lachrymal or tear glands.

If, when anything gets into a person's eye, nature's provisions, the tear, lids, and lashes were depended upon for its removal, less trouble would be caused, but the almost invariable custom is to immediately rub the eye, which treatment frequently either moves the substance further under the lids or embeds it in the conjunctiva (the membrane covering the free surface of the eye and lining the lids) and often gives rise to serious trouble.

Therefore, if dust, a cinder, or other foreign substance gets into the eye wink the lids briskly, for this movement is likely to dislodge the speck and, at the same time, blow the nose forcibly, and, if necessary, smell something, as pepper, that will make the eyes water.

If these efforts are not successful, and the speck is under the upper lid, grasp the lashes of this lid and draw it downward over the lower one and then release it and allow it to return to its normal position, as it does so the lashes of the lower lid brush its under surface and are likely to remove the foreign substance. If not, evert the lid as described in Chapter XII. and expose its under surface and wipe away the particle with the corner of a clean handkerchief. Substances lodged in the lower lid can usually be easily wiped off if the lid is drawn down and its under surface exposed as described in Chapter XII.

If these methods are not successful a doctor should be seen.

Removal of Foreign Bodies from the Ear

Insects occasionally get into the auditory canal of the ear and cause much discomfort by moving around, and children sometimes put such objects as peas, seeds, or small stones into the canal; also excess wax may accumulate and become impacted in the canal, this however is hardly a foreign substance since it is secreted by the ceruminous glands in the membrane lining the auditory canal.

Three things not to do when attempting to remove objects from the ear are: (1) attempt to remove a live insect, for such attempt is rarely successful and increases the activity of the insect; (2) never poke at anything in the ear, for this is likely to press it against the drum membrane and may injure the latter; (3) never use water for an irrigation to wash out substances that absorb water such as peas, seeds, and other vegetable matter.

To remove an insect from the ear fill the canal with a thick liquid, such as oil, which, by cutting off the insect's air supply, soon kills it and it then floats to the top of the liquid and, when the ear is turned downward, is washed out with the oil. The oil can be poured into the ear from the bottle or a medicine dropper.

If a portion of **a hard substance** that has been put into the ear is projecting from the canal the object may possibly be removed with the fingers without danger of poking it inward, otherwise, irrigation should be tried, as described in Chapter XII., and if this is not successful medical assistance should be sought. If the **object will absorb water** some alcohol should be poured into the ear, allowed to remain for a short time, and then the ear should be syringed with alcohol as described in Chapter XII. The alcohol causes shrinking of such substances.

For the removal of wax pour a little peroxid of hydrogen or what is known as soda-glycerine solution (*equal parts of glycerine, bicarbonate of soda, and water*) into the ear (*these liquids soften the wax*) and after an hour or two irrigate the ear.

Removal of Foreign Bodies from the Nose and Other Air-Passages

It is usually children who get, or rather put, foreign bodies in the nose. As a rule, **a foreign substance can be removed from the nose** if the nostril on the unaffected side is pressed upon with the finger and the child made to blow its nose forcibly, or if violent sneezing is induced, this can be done by making the child smell some pepper. If these means are not successful the nose may be irrigated, the fluid being introduced through the unaffected nostril. If the object is not dislodged a physician should be consulted. *Never try to get anything out of the nose by poking at it.*

The entrance of foreign substances into the larynx and trachea is not an uncommon accident, the usual causes being vomiting while unconscious, as while under the influence of an anesthetic, and speaking or laughing while there is something in the mouth. *It will be recalled that in the movements of swallowing the larynx is drawn beneath the back of the tongue and the epiglottis carried downward and backward so that it covers the larynx and prevents the entrance of food, etc., but except during swallowing the larynx is uncovered* (*to allow of the passage of air*) *and the movements associated with speaking and laughing have the opposite effect of those of swallowing.*

The entrance of anything into the larynx usually excites such violent coughing that it is ejected, when this

is not the case, it can frequently, if in the upper part of the larynx, be removed with the fingers or, if further down, by slapping the person on the back. While doing this it may be necessary to invert the person, *i. e.*, place her head downward, a child can be inverted by holding it by the legs, an adult by being placed on a bed or couch with the head hanging over the side. If these means are not successful, a physician should be called, even though the coughing and choking cease, because the relief may be due to the passage of the foreign substance down through the bronchi, thus freeing the air-passages. There are a number of cases on record of abscess and other abnormalities of the ung that have been occasioned by the entrance of foreign substances into a lung through the air passages.

Removal of Foreign Substances from the Alimentary Canal

Children, especially, not infrequently swallow such things as money, pins. and the like. The usual treatment is to feed the person for a day or two with soft substances such as mush or other cereal, potatoes, and bread and milk, for such material is likely to coat the foreign body and prevent it injuring the membrane lining of the alimentary canal. The stools must be inspected to see if the foreign body is passed. If it is not, after the second day, a mild laxative is generally prescribed, but a purgative should not be given and neither should vomiting be induced, because forceful contractions of the stomach or intestine are likely to press the walls of these organs upon the object and, if this is anything sharp, it may cause perforation.

If a fish bone is swallowed, copious drinks of lemon

juice or other dilute, harmless acid should be taken for the acid may dissolve the bone.

Extraction of a Barbed Object from the Flesh

To extract a barbed object, as a fish-hook, from the flesh push it sufficiently through to break off the head and then withdraw the head. The part should be covered with iodine or washed and covered with a wet antiseptic dressing.

Insect Bites

The poison of insects such as bees, ants, and the like consists chiefly of formic acid and therefore the treatment consists in the application of an alkali, such as ammonia water or a solution of washing soda, to the part. Sometimes the sting of the bee is broken off and remains in the skin, therefore it should always be looked for and removed if present.

Snake Bites

Snakes which cause poisoning are provided with fangs in the anterior maxillary region and the poison is secreted in glands that correspond to the parotid glands of the mammals and is ejected along grooves or canals in the fangs. The quantity of poison secreted varies with each species, as a rule, the larger the snake the greater the quantity secreted. The nature of the poison also varies with the species and therefore the way in which it affects those into whom it is ejected. Some poisons affect the nervous system chiefly and paralysis of the respiration is the common cause of death from such toxin; others affect

the blood in different ways, *e. g.*, some cause hemolysis, others coagulation, etc.

Treatment.—Anti-venom sera have been prepared for most of the poisons of the common species of snakes and, it is said, that a dose of the specific serum is the most, in fact the only, reliable form of treatment for snake bite. The serum may be given as a subcutaneous, intramuscular or intravenous injection. The old form of treatment, which must be tried if the specific serum cannot be obtained immediately, consisted in (1) putting a tight bandage between the wound and the heart to retard the venous circulation and consequently the rate at which the venom enters the general circulation, the bandage must not be left on longer than one hour and should be loosened at the end of three quarters of an hour, it should be loosened slowly; (2) means to extract the poison as by making the wound bleed and applying cups or sucking the wound, the latter should not be attempted if there are any abrasions in the lips as the poison may be absorbed through these; (3) injecting potassium permanganate into the wound or cauterizing the wound with heat or caustics.

Dog Bites

If the dog is not rabietic the only treatment necessary is that of a wound from other causes that is likely to be associated with infection. If there is the slightest doubt that the dog has rabies or if the fact cannot be ascertained the patient should be treated as though it had.

Treatment.—Free bleeding should be induced and the wound should then be flushed with an antiseptic and cauterized with fuming nitric acid. As soon as possible the patient should be given a dose of the specific vaccine.

Fortunately the rabietic virus is not quickly absorbed and the incubation period is a long one (*from 12 days to several years*) and thus a slight amount of delay in the prophylactic treatment is not fatal, however it should be carried out as soon as possible.

Food Poisoning

By food poisoning is meant "acute attacks of illness due to some injurious property in food or drink."[1]

The injurious matter may be: (1) a natural constituent of the substance eaten, as in the case of certain mushrooms. (2) Substances that develop in the food as the result of a natural process, *e. g.*, solanin in sprouted potatoes and ergot in rye. (3) Parasites with which the food has become contaminated. Food frequently serves as a vehicle for the transmission of various infec tions, such as typhoid, tuberculosis, and diphtheria, and of animal parasites, such as trichina and tape worms, but these infections, etc., are not classed as food poisoning, **the organisms most commonly responsible for the conditions termed food poisoning** are the *bacillus enteridis of Gaërtner* and similar strains. (4) Bacterial toxins, the only known example of this type is botulism. Until very recently another cause of food poison, viz., ptomain poison was added to the list and ptomains were supposed to be poisonous substances developed in food under the action of putrefactive bacteria. It is now believed however that there is no such thing as ptomain poisoning and that the conditions formerly attributed to this were either infection by the bacillus enteridis or acute indigestion. (5) Poisons that have been introduced into food

[1] *Preventative Medicine and Hygiene*, by M. J. Rosenau, D. Appleton and Company.

either accidentally or maliciously, or excessive amounts of preservatives. (6) Individual idiosyncrasy which causes some persons to be made ill by food that is harmless to other people. The foods most commonly responsible for such anaphylactic reactions are: strawberries, tomatoes, fish, eggs, milk, and milk products.

Food Poisoning Due to Bacillus Enteridis and Allied Species

Meat is the most common vehicle for this infection, but milk, milk products, and even vegetable foods may become contaminated. Hot weather causes conditions in the food that favor the propagation of the bacteria and thus poisoning is much more common in hot, than in cold, weather. These bacilli do not themselves change the odor, taste, or appearance of food, but they thrive better in food in which other bacteria have started decomposition than in sound food and thus are more likely to be present in harmful numbers in food in which decomposition has commenced.

Symptoms.—The severity of the symptoms vary with the number and strain of bacilli ingested. The characteristic symptoms are those of gastro-intestinal irritation, viz., nausea, vomiting, diarrhea, and abdominal pain; also there is usually intense thirst and a rise of temperature to about 102° or 103° F. and there is always some degree of prostration, as a rule, this is in proportion to the severity of the conditions promoted by the gastro-intestinal irritation and the fever. In severe poisoning there may also be various nervous symptoms, such as muscular twitching and either restlessness or drowsiness. Usually, under proper treatment, recovery occurs in a

few days, but in severe poisoning death may follow in a few hours or days.

Treatment.—This is directed toward (1) the removal of the injurious substances by an emetic (*mustard—for an adult 1 teaspoonful—in half a glass of warm water is generally used*), lavage, a cathartic, and enemata; (2) relieving the abdominal pain (*turpentine stupes are often used for the purpose*); (3) if necessary, preventing collapse.

Nothing is allowed by mouth but cracked ice, whey, barley water, and like foods in small amounts, and drugs such as bismuth preparations which temporarily coat the intestinal wall and protect it from irritation. Solid food is not given until all signs of gastro-intestinal irritation have subsided.

Botulism

This form of poisoning is due to a toxin elaborated by the *bacillus botulinus* in food in which it grows. The bacillus will thrive in any food containing protein and thus the majority of foods, either animal or vegetable, may be contaminated. It takes considerable time for the toxin to be developed in toxic quantities and thus botulism is not caused by fresh foods, but by foods that have been preserved in some way, especially canning by home methods, in which the heat to which the food is exposed is, ordinarily, not as great as that employed in canneries.

It has been found that **the destruction of the spores of the more resistant types of the botulinus bacilli requires** five hours at boiling temperature, forty minutes at 220° F. (105° C.), fifteen minutes at 230° F. (110° C.), and six minutes at 248° F. (120° C.). The toxins of most

strains are destroyed at 147° F. (65° C.) in thirty minutes.

The bacilli and their toxins cause no discernible changes in food and thus no reliance can be placed upon the odor, taste, or appearance of the food.

The botulinus toxin is a true soluble toxin. It is comparable to the toxins of diphtheria and tetanus. It is the only known toxin that causes poisoning when taken by mouth. **It has a special affinity for** the central nervous system and most of the symptoms are due to depression of nerve centers, especially those of the brain stem.

Symptoms.—The period of incubation is usually 18 to 36 hours. The first symptoms are usually a feeling of malaise, sometimes headache and giddiness, occasionally there may be nausea, vomiting, and diarrhea in the early stages, but these signs of gastro-intestinal irritation are rare and are not pronounced as in poisoning by the bacillus enteridis, in fact, as a rule, there is obstinate constipation. The most characteristic symptoms of the later stages are fatigue and progressive muscular weakness (*due to depression of nerve centers*), the loss of tone of the eye muscles results in various disturbances of vision and ptosis (*falling*) of the lids, the deficient tone of the muscles of the throat interferes with swallowing and speaking, and that of the respiratory muscles with breathing; death is generally due to failure of respiration. Also secretion is diminished, especially that of tears, sweat, and saliva. There is no disturbance of sensation and even in severe cases the mind is likely to remain clear.

Death is a **common outcome** of botulism, even when very small amounts of the poison are taken. It may occur within forty-eight hours of the time the food is eaten or not for several days, few deaths occur after the

tenth day. Convalescence is tedious and disturbance of vision and muscular weakness may persist for months.

Treatment.—The special treatment consists in the administration of a specific antitoxin. Artificial respiration may be necessary. If suspicion of poisoning is entertained early an emetic or lavage and intestinal irrigation should be given, but these are useless after the toxin has been absorbed.

To prevent poisoning canned food should be boiled before use since boiling temperature disintegrates the toxin.

Mushroom Poisoning

Several species of mushrooms contain an alkaloid known as *muscarine* which is highly poisonous.

The symptoms of poisoning may occur a few minutes after the mushrooms are eaten or not for several hours. They are: nausea, vomiting, diarrhea; weak, rapid pulse; labored breathing; profuse perspiration; the pupils are contracted at first, but later dilated. If treatment is not effectual, these symptoms will be followed by collapse, extreme muscular weakness and sometimes paralysis and death.

Treatment.—This is the same as for poisoning by food containing bacilli enteridis plus the use of atropine, which is a physiological antidote for muscarine. The usual measures to prevent collapse must be taken.

SECTION III

Diseases

The causes, nature, and symptoms of some of the more common diseases. Prophylactic measures necessary for their prevention. Nursing care required in their treatment.

The More Common Infectious or Communicable Diseases

Classification.—Diseases which can be transmitted from one person or animal to another are classed as communicable or infectious diseases. Those infectious diseases which can be contracted by coming in contact with a patient are said to be contagious. This classification dates back to 1546, which was before the discovery of bacteria, when Fracastor divided the diseases which were known to be transmitted from one person to another under two headings, viz., those transmitted "per contactum" (*by contact*) and those conveyed "per fomitum" (*by fomites*); it will be remembered that fomites are substances that can become contaminated and transmit contagium, thus towels, sheets, etc., serve as fomites. Though the term contagious is still applied to those diseases which can be contracted by contact, Fracastor's classification is no longer approved, for the

virus of contagious diseases is also transmitted by fomites and in other ways as will be seen in the description of the various diseases. Infectious diseases that are associated with a characteristic eruption are classed as exanthemata (*a word derived from the Greek and signifying eruption*). The most typical diseases of this type are the following five: scarlet fever, measles, German measles, chicken pox, and smallpox, but some authorities also include cerebrospinal meningitis, dengue, erysipelas, glanders, typhoid fever, and typhus fever.

Epidemics, etc.—When a disease attacks many people at the same time it is said to be *epidemic;* when an epidemic spreads over the greater part of the world it is said to be *pandemic;* an infectious disease that is found almost constantly in any given locality is said to be *endemic;* cases of infectious diseases that occur singly and independently of any discoverable source of infection are said to be *sporadic.*

Stages of infectious diseases.—Most infectious diseases tend to run a definite course which is generally marked by the following stages: (1) The period of incubation, which is the time following infection during which the germs multiply sufficiently to produce the characteristic symptoms of the disease. The length of this period varies in different diseases and to some extent in different cases of the same disease. Toward the end of the incubation period there may be feelings of malaise and other signs of indisposition which are referred to as *prodromal symptoms.* (2) The onset or invasion, which is the time that the characteristic symptoms of the disease are first observed. (3) The febrile or active stage. (4) The period of defervescence, during which the fever and other symptoms abate and convalescence is established

The typical exanthemata are also characterized by certain stages connected with the eruption, viz.: (1) The prodromal stage, which is the period between the appearance of the first symptoms and that of the eruption. (2) The stage of efflorescence, which is considered to exist from the time that the eruption first appears until it fades. (3) The period of desquamation, *i. e.*, the shedding of the epithelial elements of the skin.

Ways in which infection is transmitted and acquired were mentioned in Chapter II.

The measures employed to prevent the spread of infectious diseases are: quarantine; isolation; the disinfection or sterilization of all discharges containing virus, of utensils, linen, etc., that become soiled with such discharges and those that have been in contact with the patient; proper care of the hands of those caring for the patient as described in Chapter II.; the exposure of the room to sunlight and, at the termination of the disease, the proper disinfection of the room and its contents.

Quarantine and isolation are only resorted to for virulent infection that are readily transmitted.

Quarantine.—There are several kinds of quarantine, *e. g.*, (1) maritime quarantine, by which is meant the detention of ships that have come from countries where there is an epidemic raging or on which some of the passengers have developed an infectious disease during the voyage. The passengers and cargo are detained until the health authorities are assured that they cannot carry the infection into the country. (2) Inland quaran tine, which implies the restriction of travel to or from a community in which an epidemic is raging and the prevention of exportation from such a locality of material that could transmit the contagium. (3) House quaran-

tine, which includes the exclusion from a house in which there is a patient with a virulent infectious disease of all people not residents and those attending the patient and the prohibition of those residing in the house attending school and other places where numbers of people are congregated, also the house is usually placarded by the health authorities with a placard indicating the nature of the disease and the danger of communicating it to others.

Isolation.—By isolation is meant the separation from others of persons with infectious diseases. **The strictness of isolation necessary depends chiefly upon:** (1) the nature of the infection, there are two important points to be considered in this connection, viz., the readiness with which the virus can be transmitted and the nature of the disease caused by the virus, *e.g.*, chicken pox is very readily transmitted, but if the patient is properly cared for the disease is practically never followed by bad results and therefore strict isolation is not necessary, while scarlet fever, which is not as readily transmitted, calls for strict isolation because it is often fatal either directly or as the result of complications or sequelæ. (2) The degree to which those coming in contact with the patient can be trusted to take essential precautions. (3) The age and health of those exposed to infection, *e. g.*, isolation has to be more rigid when young children and those debilitated by age and disease are exposed to the infection than when this is not the case. (4) The facilities for disinfection. It has been demonstrated that in hospitals, where provision is made for the immediate sterilization of excreta, utensils, clothing, etc., if the beds in a ward are not in close proximity and the nurses are careful, those with different infections can be cared for in the same ward and by the same nurses without transmitting infection from one patient to another. In houses,

however, conditions are not as favorable for the prevention of infection transmission and therefore when a patient with a virulent infection such as scarlet fever is cared for at home strict isolation is usually required. This implies that nobody but the nurses and doctors are allowed to enter the sickroom without the doctor's permission, and nothing that has been exposed to infection is to be taken from the room until it has been disinfected.

It is generally advised that, if possible, when strict isolation is necessary two rooms and bathroom be relegated to the improvised hospital. The desideratum is that these rooms should be as much shut off from the rest of the house as possible and that they should be so situated that the sun's rays will enter them part of the day. It is to be remembered that direct sunlight is an excellent disinfectant. If, as is frequently the case in infectious diseases, the eyes are affected a shield can be worn and an umbrella or screen used for protection if necessary, but the room should be exposed to the sunlight at least part of the time.

One of the rooms set aside is for the patient and the other for a service room in which to keep articles required for the patient. There should be a gas stove in this room or the bathroom in which dishes, linen, etc., can be boiled after use. A gown for the doctor's use when he enters the sick room is kept in the service room and, if a clean one is not provided for each visit, it must be folded with the outside inward.

The nurse also should have a gown that will completely cover the uniform to wear when doing work that involves close contact with the patient. To put on the gown: remove cuffs, if these are worn and push the dress sleeves up to the elbow; hold the gown by the neck and slip first one arm and then the other into its sleeves; tie or button

it at the neck. To take it off, wash and disinfect the hands, slip the gown down, crease it down the center, with the clean side innermost, if it is to remain in the patient's room, but outermost if it is kept in the service room, fold one shoulder within the other and hang it in a suitable place. If at any time a gown is not worn when attending the patient be careful not to let the uniform touch the bed nor anything in the room.

Care of the room.—The room should be dusted daily and after use the duster should be either put with the clothing from the bed, etc., in a bag as described in Chapter II. or else boiled and washed. The door knobs should be washed daily. Both in the hospital and the home the nurses are likely to be expected to do the sweeping when strict isolation is necessary, for one reason servants are usually afraid to enter the sick room and for another it is inadvisable to have an extra person exposed to contagium. In sweeping care should be taken to prevent the dust flying about. This can be done by sprinkling the floor with "sweeping compound" before beginning to sweep or covering the broom with a damp duster. The dust should be collected in a paper and put into the waste pail, there should be some disinfectant in the latter if its contents cannot be burned.

The care of the bed linen was described in Chapter II. In home nursing it is well to put them into a clothes boiler and boil it and the towels, etc., in the service room before sending them to the laundry.

The care of excreta and other discharges was stated in Chapter II. It is even more important to disinfect excreta that has to be emptied into a vault, as is sometimes necessary in country homes, than when it is emptied into a toilet, because excreta emptied into a vault may seep into the soil and contained bacteria be washed by

the ground water into streams or other bodies of water that may be used for drinking, epidemics of typhoid have been repeatedly traced to such cause. Chloride of lime 5 per cent, twice as much of the solution as there is excreta, and, for vaults, unslaked lime are good disinfectants to use for the purpose. The lime cannot be used for toilets, but it is particularly good when the excreta is to be emptied into a vault, as it is cheap and an excellent disinfectant, since, as soon as it is moistened by the excreta, it slakes and the heat evolved sterilizes the mass almost immediately. When other disinfectants are used the excreta must be exposed to their influence from ½ to 1 hour before being emptied and, as stated in Chapter II., the container must be tightly covered during this time.

It is customary, when strict isolation is necessary, to bring food to the service room and there transfer it with a spoon and fork that have been boiled to dishes which are kept in the room and to have the other dishes removed at once. Refuse food is put into a paper bag and this into the waste pail. The patient's dishes should be boiled after use.

When permission is given to discontinue isolation the patient should be given a full bath, including the hair and, after being taken to another room, clothed in garments that have not been near the sick room. Books and toys that cannot be sterilized should be destroyed. The room should be thoroughly cleaned, all the woodwork and furniture being thoroughly washed with soap and water; the bed clothing, utensils, and dishes should be boiled; the windows opened and the room allowed to air for at least twenty-four hours, but longer if possible.

For some years it was customary to fumigate the room after any disease that called for strict isolation, but most authorities do not now consider this necessary, though

many think that it is a wise precaution to take after scarlet fever if there are children in the house, for the virus of scarlet fever is apparently able to subsist for a considerable time outside the body and it may have been ejected to some distance in the droplets ejected when the patient coughed, etc. When fumigation is resorted to the cleaning is to be left until it is completed, but it is not to be considered a substitute for the cleaning nor is it to be depended upon for the sterilization of fabrics, as the bed linen.

Formaldehyde gas is the disinfectant commonly used for fumigation, the various ways in which it can be generated for the purpose will have been learned in Bacteriology. When using it is to be remembered that gases have very little penetrating power and that therefore everything to be disinfected must be exposed to its influence, *e. g.*, cupboards and drawers must be opened, everything in them removed and hung up so that all their surfaces will be exposed to the gas, the window shades must be pulled down or the roll at the top will not be affected. All cracks around the windows and doors and the key holes must be sealed; this is usually done by pasting white paper over them—newspaper or colored paper should not be used as they may mark the paint, one door, of course, has to be done on the outside after leaving the room.

Malaria

Malaria is an infectious disease that is **characterized** by periodic paroxysms consisting of: a chill followed by fever and later by sweating; enlargement of the spleen and anemia.

Etiology.—The exciting cause is the **Hermatozoön** or **Plasmodium malariæ.** **Three species** of plasmodia have

been found to cause malaria. The names of these and the types of malaria they produce are as follows:

1. *Plasmodium vivax*, or the *tertian parasite*, which causes tertian malaria.

2. *Plasmodium malariæ* or the *quartan parasite*, which causes quartan malaria.

3. *Plasmodium falciparum*, or the *estivo-autumnal parasite*, which causes estivo-autumnal malaria and is the most common cause of pernicious or tropical malaria.

All three types of plasmodia are **transmitted** from infected to uninfected people by the female of a species of mosquito known as the *anopheles*. The blood of a person who has malaria will contain undeveloped male and female plasmodial cells and when a female anopheles bites such a person, it usually sucks in some with the blood which it takes from its victim. These sex cells mature and fuse in the insect's stomach and become encysted in the walls of its stomach and there undergo a maturation process in which each of the fused cells develops many sporozites or, as they are also called, merozites. These finally escape into the circulation of the mosquito and reach its salivary glands whence some of them are discharged into the blood of those whom the mosquito subsequently bites. Once a mosquito becomes infected with plasmodia some of the organisms may continue to propagate in its body until it dies, unless it is exposed to a low temperature. This is one reason why malaria is most prevalent in hot countries, for in cold weather the mosquitoes lose their infectiveness and only become dangerous again when, after climatic conditions are again favorable, they once more bite infected people.

Predisposing causes of malaria are environmental conditions that favor the propagation of mosquitoes (these are described later) and ill health.

If a person receiving an injection of plasmodia is in good health the chances are that the phagocytes and other protective agents of the body will destroy or hold in check the plasmodial merozites. If this does not occur each merozite will attach itself to a red blood corpuscle and use up its contents for food until there is nothing but a thin shell or capsule of it left. In the meantime the organism matures and subdivides thus giving rise to new merozites. This causes the rupture of the corpuscle, whereupon the merozites, and with them a toxin that has developed in the process of their formation, are set free in the blood. If they are not destroyed by the body's protective agents, or by drugs, each merozite will attach itself to a new corpuscle and the process will be repeated and, of course, the number of parasites in the body is greatly increased with each cycle. Thus, after a varying length of time, there will be so much toxin liberated in the blood when the corpuscles are ruptured that a chill occurs, the malarial paroxysms being induced by the toxin. The time during which the organisms are multiplying sufficiently to produce symptoms corresponds to the period of incubation, but the duration of this time varies greatly. After the onset, however, in tertian and quartan infections, the paroxysms will occur at regular intervals until the organisms are destroyed or their activity reduced, because these types always take a certain number of hours to develop. The tertian organism taking forty-eight hours to do so and the quartan seventy-two, hence, in tertian fever, the patient usually has a paroxysm every other day and, in quartan fever, every fourth day. However, a person may receive more than one infection and, in such case, the paroxysms will be more frequent. For example, if a person is bitten on Monday by a mosquito infected with the tertian organism and again on

Tuesday one set of organisms injected into the blood will come to maturity about twenty-four hours later than the organisms first injected and thus the patient will have a paroxysm every day. He is then said to have **quotidian fever.** The estivo-autumnal organism, in the first stages of its propagation, develops in twenty-four hours, but later no definite time is required for sporulation, as in the case of the other two types. Therefore, a short time after infection, there may be organisms in all stages of development in the red corpuscles and the rupture of some of these cells may occur at frequent intervals and the blood is then constantly charged with the toxin.

Pathological conditions produced in the body by the invasion of the plasmodia are: (1) A diminished number of red corpuscles. (2) Enlargement and congestion of the spleen as the result of its invasion by the plasmodia and the consequent active phagocytosis that occurs. This process goes on also in the bone marrow and blood. (3) When the disease is allowed to continue unchecked for any length of time, especially in the estivo-autumnal type, the small ducts of the liver are likely to become blocked with the débris of the red corpuscles; this is likely to interfere with the discharge of bile and cause jaundice. (4) Especially in the estivo-autumnal type, large numbers of the parasites are likely to accumulate in the capillaries of some of the internal organs and produce abnormal conditions of the affected parts by interfering with the circulation.

Symptoms of tertian and quartan fever.—The only difference in the symptoms occurring in these two types is the number of days between the paroxysms. The paroxysms generally occur about the same time on each of the days that the merozites are set free in the blood.

The patient feels relatively well on the days in which no paroxysm occurs.

As a rule a chill begins somewhat suddenly, but it may be preceded by a feeling of lassitude, headache, and pain in the bones. The duration and severity of the chills vary greatly, sometimes they last only for a few minutes, sometimes for an hour or more; sometimes there are merely sensations of cold and discomfort while, on the contrary, the whole body may shake violently and the sensation of cold may be extreme. In such case nausea and vomiting are common and young children may have convulsions. During the cold stage urine is passed frequently. As the chill subsides the temperature rises, usually proportionately to the chill, it not uncommonly reaches 105° or 107° F. after a severe chill. The pulse becomes frequent, full, and bounding; headache may be severe; there is pain in back and limbs; thirst is intense; nausea and vomiting are common. When the temperature is very high there may be delirium. This stage may last from about ½ hour to four or five hours. It is followed by profuse sweating, which may endure for an hour or more. During the time that the fever abates the other symptoms also subside so that in a few hours the patient may feel as well as before the chill.

If the disease is not soon checked anemia and sometimes cachexia (described later) develop.

Estivo-autumnal malaria.—This type of malaria is quite common in tropical countries, but is only occasionally encountered in temperate zones and then in the summer and fall, hence its name.

Symptoms.—Paroxysms are likely to occur daily for a short time, but the chill and sweating stage are not usually as marked as in the other types, but in severe infections the temperature may rise very high at times,

occasionally even reaching 108° or 109° F. Sometimes there is no actual intermission of the fever, instead the temperature remains continuously high with but slight remissions such as occur at the height of typhoid fever, in fact, both the temperature and general appearance of the patient are very suggestive of typhoid. If the parasites are not soon destroyed the patient becomes markedly prostrated, very anemic, more or less jaundiced, is likely to be delirious, and what is known as pernicious anemia may develop.

Pernicious malaria.—Pernicious malaria is almost always the result of a severe infection with the estivo-autumnal organism, but occasionally it is caused by the other organisms.

Symptoms.—These are due both to the toxemia and to the accumulation of the plasmodia in the capillaries of the internal organs. Thus they differ to some extent according to the organ that is chiefly affected. In all cases there are symptoms similar to those of a severe estivo-autumnal infection and, in addition, if the organisms have accumulated in the brain, cerebral symptoms, such as delirium followed by coma, or, if the vessels of the gastro-intestinal tract are affected, there will be intense purging and vomiting followed by collapse. The condition is nearly always fatal and death may occur in a few hours from the time that the malignant symptoms are observed. This may be almost at once after the onset of the primary symptoms or only after a prolonged illness.

Malarial cachexia.—This condition may follow repeated attacks of malaria or it may be established by one severe attack, and occasionally it develops after prolonged residence in a malarial district independently of typical paroxysms. It is characterized by a general deterioration of the health associated with more or less

severe anemia, permanent enlargement of the spleen, jaundice, and irregular febrile attacks upon slight provocation, such as exposure to cold, or mental or physical strain. Individuals with malarial cachexia bleed easily and even slight wounds are likely to be associated with severe hemorrhage. Also there is danger of future hemorrhage as the result of rupture of the enlarged spleen. When malarial cachexia develops in childhood growth and development are greatly retarded.

Distinguishing features and habits of the anopheles.—The anopheles is a small mosquito, of dark color, but with light spots on its wings. One of the easiest ways of distinguishing the anopheles from the more common mosquito (*the culex*) is by observing the way in which it rests on a flat surface as a wall. The culex is described as standing hunch-backed upon such a surface, but the anopheles stands in such a manner that the main part of its body projects at right angles with the wall.

The female anopheles lays her eggs in stagnant water and in shallow pools that are not disturbed by the current, even the water in drains and gutters will serve as breeding places, in fact the mosquito will even use water left standing in pails, etc., in houses. The eggs float on the surface of the water and larvæ develop from them in a few days. Under favorable conditions the larvæ mature into mosquitoes in between two and three weeks. If kerosene is poured over the water it will prevent the anopheles settling on the latter to lay their eggs and it will destroy the larvæ.

The anopheles do not fly high nor very far and therefore, unless they are carried by the wind, they are not found more than half a mile from their breeding places.

The anopheles usually remain dormant during the daytime and only become active after sundown.

As previously stated a mosquito's infectiveness is destroyed when it is exposed to cold (below 60° F.) Thus it can be seen why hot countries where there is a heavy rainfall and much marshy land are the ones in which malaria is most prevalent.

Prophylaxis.—To wipe out malaria from a district there are three essentials, viz.: (1) To do away with breeding places for the mosquitoes by draining marshy lands, removing gutters and drains, covering pools, etc., that can not be drained with kerosene (one ounce of kerosene will cover fifteen square feet of water surface, the kerosene must be renewed weekly); if water has to be kept in barrels, pails, etc., keeping the receptacles tightly covered. (2) For the inhabitants, both those who are well and infected, but especially the latter, to protect themselves from being bitten by mosquitoes by sleeping under mosquito nets and having the doors and windows of their houses protected with wire netting. (3) For the inhabitants to take quinine, which is a specific for malaria until the disease is eradicated from the district. How successfully malaria can be stamped out by these methods was demonstrated during the building of the Panama Canal.

Treatment.—For the chill, the patient is put to bed, surrounded with blankets and hot-water bottles and, if not nauseated, given hot drinks. If there is nausea a mustard paste is sometimes applied to the epigastric region. During the febrile stage, phenacetin or similar drug is likely to be prescribed to relieve the headache and to act as an antipyretic, sometimes cold sponge baths are ordered if the temperature continues high. During the sweating stage the skin must be dried as often as necessary.

It is generally advised that, even in mild infections, the patient should remain in bed until the parasites have been

sufficiently destroyed to prevent paroxysms, for the disease is more easily overcome when this is done; however, those with a moderate quartan or tertian infection often get up and return to work a short time after a paroxysm. If the health is not good the necessary means to improve it are taken.

After a paroxysm, or even feelings of indisposition that indicate infection, the quinine is increased from the usual prophylactic dose of 4 to 6 grains (for adults) to from 20 to 30 grains, or even larger doses in severe infections.

Typhoid Fever

Typhoid fever is an acute febrile infective disease, characterized chiefly by: ulceration of the intestinal lymph follicles, especially the groups known as Peyer's patches; enlargement and congestion of the spleen; some abdominal distention and tenderness; continuous fever; and a characteristic eruption.

Etiology.—The active cause is the *Bacillus typhosus*. The bacilli enter the body through the alimentary tract, pass to the spleen, lymphatic system and bone marrow. They propagate in these parts and are discharged into the blood where many of them are destroyed. An endotoxin is then liberated which is responsible for most of the abnormal conditions and consequent symptoms. The bacilli are given off from the body in the feces, urine, mouth secretions, and sometimes the vomitus and in pathological discharges, as pus, if they occur during or following the disease. Anything that becomes contaminated with the excreta and discharges may cause infection. The typhoid bacilli may remain and propagate in an individual's body especially the gall-bladder, for years after recovery from the disease and if the person is

not particularly cleanly in his habits he will be a danger to the community.

Common sources of infection are: (1) Water supply that becomes contaminated with infected excreta. (2) Infected milk and other uncooked food—frequent causes of food infection are: flies that have been in contact with infected excreta; the use of contaminated water for watering or for washing the utensils used to contain the food; handling of the food by a person with virus on the hands; oysters grown in beds near points where the city sewage empties have been found to contain the virus and have been the cause of epidemics.

Typhoid occurs most frequently between the ages of fifteen and twenty-five. It occurs at all times of the year, but is most common between the months of August and November.

One attack usually confers **immunity.**

The usual period of **incubation** is two to three weeks.

Pathology.—(1) The abdominal lymphatics, especially Peyer's patches, and the surrounding tissues become red and swollen, the congestion being partly due to the large number of leucocytes that collect in and about the lymph-nodes, this stage lasts about seven to ten days and is followed, except in very mild infections, by a stage of necrosis and ulceration of the affected tissue. In favorable cases the ulcers gradually heal after two or three weeks, but hemorrhage and perforation of the bowel wall are likely to occur when the ulceration is pronounced. (2) The spleen is soft and enlarged. (3) The liver, kidneys, and heart may be the seat of degenerative changes. (4) A catarrhal condition of the respiratory tract is common.

Symptoms.—These vary considerably according to the severity of the infection. In cases of moderate sever-

ity there will be **prodromata,** consisting usually of backache, headache, loss of appetite, lassitude, either diarrhea or constipation, sometimes pain in the right iliac region, nervous irritability, malaise, congestion of the throat and neighboring parts, cough, slight deafness, epistaxis. There is, as a rule, no marked **invasion** and this is considered to occur when the temperature begins to rise. **In the first week** following the invasion the temperature gradually rises, being about a degree higher each day, so that by the seventh day it may reach 104° or 105° F. in the evening, but the morning temperature is usually from 1 to 3 degrees lower. The pulse is slow in proportion to the temperature. The face becomes flushed, the skin hot and dry, the eyes blood-shot. Headache and tinnitus may be extreme and deafness quite pronounced. The muscles of the back and legs are sore. The tongue becomes coated on the back and center with a creamy-colored fur, but it is clear at the tip and edges, there is a disagreeable taste in the mouth, the appetite is lost, thirst is excessive. There may be either constipation or diarrhea, especially in the latter case, the stools tend to become the consistency and color of pea soup. By the end of the first week the spleen begins to enlarge, the blood may give the Widal reaction,[1] and the rash may appear. **The rash consists** of discrete, small, slightly elevated rose-red papules that disappear on pressure. They are rarely numerous, only about ten or twelve appearing at a time. They are usually found chiefly on, or in proximity to, the abdomen, and tend, after the

[1] If a drop of blood-serum prepared from the blood taken from the patient's vein is mixed with a culture of typhoid bacilli it will, as a rule, if the patient has typhoid, cause the bacilli to lose their motility and collect in clumps. This test for typhoid was first demonstrated in 1900 by Widal, a French physician.

seventh to tenth day of the disease, to appear in crops throughout the febrile stage of the disease, each crop lasting about three days. **In the second week** the temperature remains elevated being, in the evenings, about the degree reached at the end of the first week, but the morning remissions are not as marked as in the early stage; the pulse becomes somewhat more frequent and is likely to be dicrotic; the spleen becomes larger, there may be sudamina (*small blisters*) due to the retention of sweat in the upper layers of skin; prostration and apathy become pronounced and there may be delirium, especially at night, as a rule, however, the delirium is not of an active variety, but merely a mental confusion, and inability to understand existing conditions, typhoid patients are very likely to want to get out of bed to go to work, go home, etc. The tongue becomes more heavily coated and dry and the coating assumes a brownish hue; if the mouth is not properly cared for sordes will collect on the gums and teeth. The abdomen becomes somewhat distended, a pronounced distention is an unfavorable condition because the pressure of the gas (to which the distention is due) favors hemorrhage and perforation. The urine is scanty and may contain albumin. Hemorrhage from the intestinal ulcers may occur. **In the third week** emaciation and weakness become pronounced and there may be muscular tremor, marked tremor is a bad indication. It is during this week that there is the greatest danger of hemorrhage and perforation. However, when conditions are favorable, the morning remissions of temperature are more marked and, toward the end of the week, the temperature begins to decline gradually, being a little lower each day, also the severity of the other symptoms begins to decline. **In the fourth week** the temperature falls by lysis, the other symptoms likewise

subside, the appetite improves, the strength increases and, if there is not a relapse or other complication, convalescence begins. It is however likely to be prolonged and associated with anemia, falling of the hair, and sometimes desquamation of the skin.

In mild infections the course of the disease may be shorter than that just described and, sometimes, the symptoms may be so moderate that, for a time, the patient does not go to bed, this is known as **ambulatory typhoid.** It is a dangerous condition both to the community and to the individual. In the former case, because the stools are not disinfected and in the latter because, though the toxemia is not great, the intestinal ulcers may become deep enough to allow of hemorrhage or perforation, which accidents are helped by the patient's activity. Occasionally what is known as **abortive typhoid** occurs, in this the onset may be quite severe, but the disease terminates more or less abruptly in about ten to fourteen days, presumably because the individual's cells form antibacterial substances more readily than usual. **In severe infections** the onset of the invasion is sometimes marked by a chill and the symptoms are accentuated. **Conditions which show that a patient is not overcoming the infection well are:** Excessive apathy, low muttering delirium, pronounced subsultus, carphology, weakening of the pulse, limitation of temperature remissions. (*Conditions similar to these may occur in a number of diseases that are associated with severe toxemia and in description are usually referred to as a typhoidal state.*)

Complications and sequelæ.—Complications that are often due to lack of proper nursing are: Bed-sores, ulcerative and inflammatory conditions of the mouth and throat, and otitis media. Also there may be intestinal

hemorrhage, intestinal perforation and consequent peritonitis, bronchitis, pneumonia, thrombosis, phlebitis and typhoid spine; also periostitis (*inflammation of the periosteum*) and gall stones are not uncommon sequelæ.

Hemorrhage results from injury to the blood-vessels in an ulcerated area. The bleeding may not be more than a capillary oozing and the only evidence of its occurrence will then be a small amount of blood in the stools, or, if there is no defecation for some time, a black tarry appearance of the stools, for the blood is digested if it remains long in the bowel. If the hemorrhage is moderately profuse there will be a temporary fall of temperature and the pulse becomes accelerated, if the bleeding is not copious the patient may seem better for a time. The temperature soon rises however and, if it is not taken at the time of the hemorrhage, the fall may not be noted, therefore any quickening of the pulse is to be regarded as suspicious of hemorrhage. If the hemorrhage is severe the usual symptoms of collapse may follow, the pulse will become frequent, and the skin pale and covered with perspiration.

Perforation is due to deep ulceration and sloughing of one or more of the inflammatory foci; it rarely occurs before the third week. As the result of perforation some of the intestinal contents (which always contain large numbers of bacteria) pour into the peritoneal cavity and, if the condition is not recognized at once and relieved by operative measures, peritonitis ensues and is almost invariably fatal. The primary symptom, which occurs at the time of perforation, is a sudden sharp pain in the abdomen. This may only endure for a minute or two and, if the patient is very apathetic, he may not even complain of pain, therefore a cry or facial expression indicative of pain should always be reported to the physician *immedi-*

ately. Symptoms that soon follow are: A rise of temperature, quickening of the pulse, vomiting, hiccough, distention of the abdomen, rigidity of the abdominal muscles, and a peculiar facial expression. The perforation is very often associated with hemorrhage.

Typhoid spine is most likely to occur during convalescence. As a rule, it is characterized chiefly by pain in the lower part of the back and sometimes the pain extends into the legs. In severe cases the entire spine may become rigid and stiff and the pain intense and in such cases there is likely to be a rise of temperature. The condition, it is thought, may be either a neurasthenic manifestation or the result of inflammation of some of the vertebræ or the tissues surrounding these.

Phlebitis is most likely to occur late in the disease. It is usually one of the femoral veins that is affected. Pain and stiffness of the leg are the principal symptoms. The chief danger of the condition is the formation of a thrombus and consequent embolism, in fact, some authorities believe that the primary condition is more often thrombosis than phlebitis. These complications are more fully described with the diseases of the blood and blood-vessels.

Prophylaxis.—Typhoid vaccine is now very generally given to those exposed and those likely to be exposed to the disease. It has been found that when this precaution is taken where a large number of people are living in crowded quarters, as in the army, the number of cases that develop is very much less than when, under similar circumstances, the vaccine is not used.

Proper disinfection of discharges, bedding, etc., will prevent transmission of the disease and therefore strict isolation of the patient is unnecessary, but the disinfectant measures required when the virus is in the feces

urine, and mouth discharges must be rigidly adhered to.

Treatment and nursing care.—For reasons given in the section describing the treatment of fevers, **cold baths** are usually prescribed to be given every four hours when the temperature is above 102.5° F. The bath temperature ordered varies, but the average is about 85° F. for the first bath and 80° to 70° F. for the others. Higher temperatures are likely to be prescribed when the patient is very young or old, or when he does not react well, and a lower temperature when the patient reacts well and has a high temperature. As a rule, except perhaps at the onset of the disease, **enemata** are more commonly used to prevent constipation than cathartics, because they tend to wash out the large intestine thoroughly (*this is where feces is chiefly retained*) and, if properly given, they will not induce pronounced increase in the peristalsis of the small intestine, which it is important to avoid on account of the presence of the ulcerating lymph nodes; enemata must be given slowly, however, to avoid sudden or undue distention of the bowel. As the febrile stage is prolonged and the disease associated with a tendency to emaciation and prostration, it is very essential for the patient to be kept well nourished and therefore a liberal supply of easily digested nutritious **food** is essential. The amount ordered varies, but, for adults, enough to yield 2500 to 3000 per day is a common prescription. Liquids form the bulk of the food used during the febrile stage, but jellied cereal gruels, wine jelly, ice cream, junket, soft cooked eggs, and similar soft foods are generally allowed. **Other particularly important points in the nursing care required during typhoid are:** Care must be taken when lifting and moving a patient to avoid strain on his abdomen,

which would favor hemorrhage and perforation. A typhoid patient who shows the slightest mental confusion should not be left unwatched, for he is then very likely to get out of bed. The mouth must be kept clean and well lubricated and the skin clean and dry—a warm soap and water sponge bath should be given at least twice a week while the cold baths are used and, as soon as these are discontinued, daily. Parts that show signs of pressure should be bathed every three hours with alcohol, or an astringent lotion, and means should be taken to prevent pressure on such parts. Old people especially should not be allowed to lie for long intervals in one position, for this favors the onset of hypostatic pneumonia. A very liberal amount of water should be given. A careful record must be kept of the hours at which urine is voided, for retention is common.

If hemorrhage occurs the patient must be kept exceedingly quiet, baths are discontinued, and nothing is given by mouth, except possibly a little cracked ice, until ordered by the physician. Morphine is generally prescribed and also the application of cold to the abdomen, the cold may, by reflex action, cause the contraction of the bleeding vessels. Operative measures are resorted to for **perforation.**

For phlebitis or venous thrombosis, the part is usually wrapped in a thick layer of cotton and raised on a pillow. It must be kept absolutely at rest and never rubbed.

Paratyphoid Fever

Paratyphoid fever is an acute infectious disease that is similar in most respects to a mild attack of typhoid, except that the blood does not give a Widal reaction with the bacillus typhosis, but with one or other of two similar

strains of bacteria known as the *paratyphoid bacillus A and the paratyphoid bacillus B.*

The necessary prophylactic measures are the same as those used for typhoid, except that vaccine employed is prepared from parathyroid bacilli. **The treatment and nursing** care are also the same as for typhoid.

Tuberculosis

Tuberculosis is an infectious disease characterized by the formation of nodules in the parts invaded by the causative organism. This may be in almost any organ of the body.

Etiology.—The active cause is the *Bacillus tuberculosis.* Predisposing causes are: An inherited predisposition; damp, cold climates; living in dark, poorly ventilated, over-crowded rooms; occupations that involve the inhalation of irritant gases or dust; a contracted chest wall; diseases associated with catarrhal conditions of the respiratory tract; diseases that interfere with nutrition.

The most common sources of infection are: (1) The inhalation of droplets exhaled by a person with the disease when coughing, sneezing, and the like (droplet infection); (2) the inhalation of dust containing bacilli, this source of infection is provided by people who spit on the ground; (3) eating infected food—the most common sources of food contamination are: direct infection by a person with the disease, the lighting of flies that have become soiled with tuberculosis sputum upon the food; contamination by infected dust; milk and uncooked meat from tuberculous cows may contain the bovine type of bacillus which, it is believed, will cause tuberculosis in children though it rarely does so in adults.

The bacillus is killed readily by sunlight but it may remain alive for days if embedded in sputum or pus, especially when in a poorly lighted room.

Pathology.—When the germs find lodgment in any part of the body the connective tissue cells in the area are stimulated to reproduction and they proliferate rapidly around the bacteria thereby forming small nodules that are known as tubercles (*hence the name of the disease*). The imprisonment of the bacilli may cause their death, or at least render them inactive, sometimes for years, but if the bacilli are not killed their toxins may induce necrotic changes in the tubercles and reduce them to caseous (*cheesy*) masses. However, the tissue cells continue to proliferate and form new walls around the invaders and may destroy them or once more render them inactive and in such case the tubercles are likely to become calcified (*hardened by the deposition of lime salts*), but if the germs are not all destroyed their toxins may at any time once more induce necrosis of the tubercles and surrounding tissue and if, as frequently occurs, pyogenic bacteria gain entrance to the site of disturbance the necrosis becomes associated with suppuration.

Pulmonary Tuberculosis

(*Phthisis. Consumption*)

In a lung, when the disintegration process just described is not arrested, the small bronchi in the affected area become perforated and the softened tissue and bacteria are expectorated through the air passages. Also some of the liberated bacteria invade neighboring portions of the lung and more tubercles form and so on until finally, if the disease is not arrested, large portions of the

lung may become degenerated and then one of two things may occur: (1) cavities with ulcerating walls may be left from which suppurating matter will continue to be expectorated—sometimes practically a whole lung will be lost in this way; (2) there may be little cavity or no cavity formation but the disintegrated lung tissue becomes replaced by fibrous tissue. Even in the early stages of the necrosis some of the blood-vessels in the area may be ruptured and hemoptysis (*hemorrhage from the lung*) occur. The pleura surrounding the affected lung is very likely to become inflamed and it may do so very early in the disease when the outer parts of the lung are diseased. At almost any time, until the last stages of the disease, there is a chance of the tubercular process being arrested by the victory of the connective tissue cells, but the lung tissue will not be regenerated and thus the cavities or fibrous tissue will remain and, as the fibrous tissue tends to contract, a lung that is or has been the seat of an at all extensive tuberculous process is likely to be smaller than a normal lung and the shape of the chest is likely to be changed.

In about half the autopsies that are performed a few tubercles are found in some part of the body, even when no history of tuberculosis was given, and therefore it is believed that slight tuberculous infections that are overcome by the encapsulation of the bacteria are common. Moreover it is believed that, even when the disease only becomes apparent in adult life, infection almost invariably occurs during youth.

Pulmonary tuberculosis **manifests itself most frequently** between the ages of fifteen and forty.

There are two fundamental **types of the condition,** viz., acute and chronic and two distinctive types of each of these, those of the acute type being lobar pneumonic

and broncho-pneumonic, and of the chronic type, ulcerative and fibroid tuberculosis.

Acute Pulmonary Tuberculosis

Symptoms.—The symptoms at first are similar to those of either lobar- or broncho-pneumonia as the case may be and, for the first week or two, the discovery of tuberculosis bacilli in the sputum may be the only indication of the true nature of the process, but the symptoms fail to abate at the time that they would were the process an uncomplicated pneumonia; instead the temperature gradually becomes markedly remittent, the pulse more frequent, the sputum muco-purulent and frequently of a greenish color, chills and sweats occur, anemia and emaciation become pronounced. Death may occur between, as a rule, three weeks and four months, or the condition may gradually assume the characteristics of one of the chronic types. An acute process may also occur in the course of either of the chronic forms.

Chronic Pulmonary Tuberculosis

Both of the chronic forms of pulmonary tuberculosis may be chronic from the onset or they may develop from an acute attack.

Symptoms.—These are likely to develop very slowly and at first they are not always at all characteristic. Usually the first symptoms are those of a cold that does not become cured. The cough is likely to be hacking and especially troublesome at night and when the individual first arises in the morning; the voice is likely to become hoarse and there may be some expectoration, this at first is merely mucus. After a time there will be a gradual loss of appetite and strength, anemia develops; and in the

evenings the temperature rises slightly and the pulse becomes more frequent, but during the first stages of the disease the patient is likely to feel better and more animated while the temperature is raised and also to look better, for the face becomes slightly flushed and the eves bright. As the disease progresses, chills may occasionally precede the afternoon rise of temperature, night sweats and digestive disturbances become common, and hemorrhage from the lungs may occur. Not infrequently hemorrhage is the first symptom that the individual pays attention to, for one of the peculiar characteristics of the disease is the tendency of the patients to minimize the importance of symptoms and to be unusually hopeful of immediate recovery.

As the disease progresses the symptoms just described become more pronounced and, as soon as the disintegrated tissue becomes discharged into the bronchi, the sputum becomes more or less purulent and finally what is known as nummular sputum (described in Chapter VIII) is common, and pain due to inflammation of the pleura may be a common occurrence. In some cases pleurisy develops very early in the disease. In the fibroid type the fever and sweating are usually less pronounced than in the ulcerative form.

The course of chronic tuberculosis is variable; sometimes the symptoms grow steadily worse, sometimes slowly, sometimes relatively rapidly, in other cases the symptoms abate and the patient seems almost well when a relapse occurs, and such periods of comparative health and relapses may continue for years; in other cases the symptoms promptly disappear and do not return.

Prophylaxis.—Spitting on the ground is prohibited by law in some states. In industries that involve the production of dust or irritant gases means to prevent their in-

halation should be taken. Every one should form the practice of holding a handkerchief in front of the nose and mouth when sneezing or coughing. Public drinking cups and towels should not be used. Every child should be taught not to put its fingers, pencils, money, etc., in its mouth nor anything as fruit, cake, candy, whistles, etc., that another child has had in its mouth; not to wet its fingers in its mouth before turning the leaves of a book; not to put its lips near the spout of a drinking fountain; to wash or peel fruit before eating it.

People with tuberculosis should be particularly careful to avoid coming in close contact with others, and especially not to kiss anyone. A person with tuberculosis should not sleep in a room with non-infected people and it is advised that the floor of the patient's room, if not of hard wood and frequently polished, should be covered with linoleum and this should be washed frequently, also the rugs and draperies should be of a nature to allow of their frequent cleansing. The room should be kept well aired and all the sunlight possible admitted. Handkerchiefs, towels, etc., used by a person with pulmonary tuberculosis should be disinfected or boiled before being sent to the laundry or else those responsible in the laundry should be advised that they may contain infective matter so that proper precautions may be taken in their disposal.

Treatment.—If possible to avoid it patients with tuberculosis should not live in a damp climate. They should be out-of-doors as much as possible, but should avoid exposure to dampness and chilling of the body; they should likewise avoid badly ventilated rooms. They should take a liberal amount of nutritious food. For a time it was customary to force them to take a superabundance of food, but this often caused distress and

digestive disturbances, and the present custom is to give as much as can be taken without doing this and yet maintain the normal weight. Foods with a high caloric value are used so that the bulk of a meal will not seem excessive. If the patient's digestion is not normal the day's ration is divided into four or five meals. A patient whose temperature rises above normal in the afternoon is kept in bed, at absolute rest, until it ceases to do so and has remained normal for some days. The temperature is taken four, six and eight P.M., so that if a rise occur it will not be missed. When the temperature is normal and other conditions are favorable, exercise is usually advisable and, in most sanatoria for tuberculous patients, those whose condition is favorable are expected to take specified amounts daily, the amount is definitely specified by the physician and, of course, depends upon each patient's general condition.[1] It is very essential that the teeth,

[1] *The reasons why rest and definite amounts of exercise are important are: exercise and excitement increase the rate of the heart's action and therefore of the flow of the circulatory fluids (blood and lymph) and the absorption of tissue lymph. This naturally hastens the absorption of germs and their toxins. Also exercise and excitement tend to increase the rate of breathing and therefore the activity of the lungs. As the fever is produced by the effects of the toxins on the system its presence shows that the system is not overcoming the poison as it should. On the contrary, when the fever is overcome, the indications are that the body's defenses are winning the battle and then exercise is allowed, very little at first, so that no more toxins than the body can neutralize will be absorbed and then, if lack of symptoms show that the body's defenses are still winning the victory, a little more each day, until the patient is able to take the amount of exercise that will be equivalent to that which he will be required to take when he returns to his ordinary method of living. This should not involve more exercise than it is found he can take without becoming fatigued or losing weight. If at any time his temperature begins to rise or he has blood in his sputum, he should stay in bed until conditions return to normal.*

mouth, and throat be kept clean and in a healthy condition, for abnormal conditions of these parts favor the extension of the tubercular process to the larynx and, if this occurs, it will add greatly to the patient's discomfort and lessen his chances of recovery. The inhalation of volatile drugs, such as creosote, is sometimes prescribed, because this tends to keep the air passages in a good condition and to lessen coughing. Heliotherapy, especially sun baths, is frequently employed. Tuberculine is sometimes used to stimulate the individual's cells to form more antibacterial substances to overcome the bacteria. Sometimes, in advanced cases, the physician produces an artificial pneumothorax (*air in the pleural cavity*) by puncturing the chest wall and thus letting air into the pleural cavity. This causes the lung to collapse and thereby makes it rest for a time. Normally, after the puncture heals, the air is absorbed and the lung resumes its functioning.

If hemoptysis occurs the patient must be kept very quiet, mentally and physically, and must be reassured, as a matter of fact it is rarely fatal. Morphine is usually prescribed for it keeps the patient quiet and lessens excitement and coughing. If the hemorrhage is severe the foot of the bed is raised, ice-caps are placed over the lung, and ice may be given by mouth.

Acute Miliary Tuberculosis

This form of tuberculosis generally follows a local tubercular process and it is thought to be frequently due to the rupture of a tubercle into a vein, which results in the presence of large numbers of bacilli in the blood and their transmission to various organs, with the consequent

formation of tubercular processes in these and in the lymph nodes.

Symptoms.—These vary somewhat according to the organs most affected, common ones are: The onset is likely to be somewhat gradual and marked by loss of appetite, headache, malaise, lassitude, apathy, and the tongue becomes brown and furred. The course of the temperature varies, it is likely to be between 102° and 104° F., being higher in the evenings than in the morning. The breathing becomes rapid and the pulse frequent. Profuse sweating is common. If the lungs are involved there will be coughing and sometimes dyspnea and cyanosis. As the disease advances there will usually be low, muttering delirium, subsultus tendinum (*twitching of the muscles and tendons*), carphology (*picking at the bed clothes*), and stupor. The condition is almost invariably fatal and death may result in a few days from the time that the symptoms become pronounced, though sometimes it does not do so for several weeks.

Treatment.—This is the same as for the general treatment of pulmonary tuberculosis and for fevers from other causes.

Laryngeal Tuberculosis

Tuberculosis of the larynx may occur as a primary infection, but it more commonly complicates tuberculosis of the lungs.

Symptoms.—The special symptoms are: Hoarseness, aphonia (*loss of voice*), hacking cough, and pain in the throat.

Treatment.—This is the same as the general treatment for pulmonary tuberculosis, also the patient should be made to realize that talking is harmful and should be

indulged in as little as possible and local sprays that cleanse and stimulate the membrane and lessen pain are used.

Tuberculosis of Bones and Joints

Tuberculosis of these parts is quite common in childhood. The condition frequently follows injury to a part because the injury lessens the resistance of the cells in the area to the bacilli brought to them by the blood. Tubercles are formed as previously described and later these may degenerate forming many necrotic areas. The destruction of the bone results in deformities and in stiffness of the affected joints. Most cases of Pott's disease (*hunchback*) are due to this cause. If pyogenic bacteria gain access to the part abscesses will form.

Symptoms.—These may appear very gradually, frequently the first one noticed is stiffness of the affected part. Later there may be pain, swelling, muscular spasms and limited motion, and shortening and atrophy of the muscles in the area. The changes in the bone tissue and muscles will cause deformities. The toxemia is usually much less marked than when the process is in soft tissues, therefore the general signs of tuberculosis (temperature, sweating, emaciation) are not always as evident.

Treatment.—Casts, splints, braces, and other forms of orthopedic appliances are used to immobilize the part and, if necessary, lessen weight upon it. If suppuration or extensive necrosis occur, operative measures will be necessary. The general treatment for pulmonary tuberculosis (diet, fresh air, rest, tonics, heliotherapy, and the use of tuberculin) is employed.

Tubercular Adenitis

(*Tuberculosis of the Lymph Nodes*)

The tuberculous process may be confined to localized groups of nodes, as the cervical or the mesenteric, or it may involve practically all the groups in the body. **It occurs** chiefly in young children.

Under favorable conditions the tubercles may become calcified in which case they will remain permanently as firm hard lumps, but they may be so small that they will cause no trouble. If this does not occur the nodes become much enlarged and matted together and, sooner or later, pyogenic bacteria are likely to gain access to the nodes and then suppuration occurs and, if an incision is not promptly made, the abscess generally ruptures.

Symptoms.—If a localized infection of superficial nodes is not virulent the only symptoms may be a tendency to anemia, gradual loss of weight and strength, and the appearance of small lumps, these in cervical adenitis, which is one of the most common forms, are on the side of the neck. They are not painful to the touch, unless there is an associated pyogenic infection, but they tend to become steadily larger and the skin becomes adherent to the underlying mass, also it becomes thickened and is likely to assume a purplish hue. If the infection is at all severe, there is likely to be fever in the afternoons.

Treatment.—The special prophylactic measure consists in proper care of the mouth and throat, this includes the removal of adenoids and abnormal tonsils. The treatment consists in measures to improve the general health, such as nutritious food, life in the open air, and proper bathing. Cod liver oil is commonly prescribed. The X-rays may be used. If the condition is not over-

come by these means operative measures may be necessary.

Tubercular Peritonitis

Pathology.—The peritoneum may be the seat of scattered tubercles or of masses of tuberculous tissues caused by the fusion of the tubercles. The membrane becomes more or less adherent to the intestines which may become matted together by adhesions; the omentum becomes thickened and may be rolled up into tumor-like masses. There is usually a collection of fluid which is likely to be encapsulated in the sacs formed by the adhesions. This fluid at first is of a serous nature, but it may become purulent and it may contain blood, because of the rupture of capillaries by the tubercular processes.

Symptoms.—These vary considerably. Common ones are: Gradual loss of strength, constipation or diarrhea, frequent vomiting, ascites, tympanites. The temperature is variable, but there is likely to be slight fever. There will be more or less abdominal tenderness and there may be paroxysms of pain. After the disease has progressed to some extent, masses may be felt in the abdomen.

Treatment.—This is similar to the general treatment for other forms of tuberculosis, also the collections of fluid are sometimes removed by aspiration and a laparotomy may be performed and the abdominal cavity irrigated with hot salt solution.

Tuberculous Meningitis

This occurs most frequently in children.

Symptoms.—The onset is generally gradual. The child becomes irritable, there is gradual loss of appetite,

weight and strength. Then headache becomes severe and because of it, the patient frequently emits a sharp, short, typical cry—*the hydrocephalic cry.* Projectile vomiting is common. The pulse becomes irregular and slow in proportion to the temperature, the latter is variable, but as a rule it does not rise above 103° F. Mental dullness becomes extreme. The neck and back generally become stiff and the head retracted. Kernig's sign (described Chapter VIII.) can usually be obtained. Convulsions, twitching, and other signs of nervous irritation are common at first, but are likely to be followed by paralysis and coma. Recovery rarely if ever occurs, the patient usually dying between 2 and 4 weeks.

Treatment.—The patient must be kept comfortable and disturbed as little as possible. Lumbar puncture is performed to remove excess cerebrospinal fluid which causes pressure on the brain and increases the intensity of some of the symptoms. Otherwise the treatment is that usual in fever from other causes.

Influenza

(Grip)

Influenza is an acute contagious disease that may be sporadic, endemic, epidemic and occasionally becomes pandemic.

Etiology.—The *Influenza bacillus of Pfeiffer* is considered to be an important causative factor, but it is thought that it is not the only agent in the more severe cases. The disease is thought to be contracted chiefly during proximity to patients and to carriers by droplet infection, *i. e.*, from the droplets ejected by an infected person when coughing, sneezing, etc. It is believed that the invasion starts in either or both the respiratory

tract or the conjunctiva, one reason for the latter supposition being that conjunctivitis is frequently present in the early stages of the disease.

The duration of a person's infectiousness has not been definitely proven but it is thought to exist from the appearance of the first symptoms, possibly before, until the completion of convalescence.

One attack does not confer **immunity.**

The period of incubation is from twenty-four hours to four or five days.

Pathology.—One of the most characteristic features of the disease is an undue dilatation and congestion of the capillaries, especially, as a rule, those of the mucous membrane in the air passages, though sometimes it is chiefly those of the central nervous system or of the gastro-intestinal tract that are affected. In the more congested areas there will be edema and, in severe cases there may be hemorrhages, this is especially likely to be the case when the streptococcus hemolyticus is present.

Symptoms.—These vary according to the severity of the infection and the part that is principally affected. The most typical ones are: Abrupt onset, beginning with a chill, the temperature rises rapidly, but may soon be somewhat reduced, because of the dilated condition of the skin vessels and of the profuse perspiration which soon occurs; feelings of malaise, pain in the eyes, limbs and lumbar region; the pulse is likely to be slow in proportion to the temperature, prostration is likely to be pronounced. As a rule there is no leucocytosis. **In the respiratory type of the disease,** in addition to these symptoms, there will be coryza, sneezing, cough, more or less discomfort attending breathing, and, in extreme cases, the symptoms of pneumonia develop; these however are usually due to secondary infection with the pneumococcus. In

the gastro-intestinal type the special symptoms are: Abdominal pain and distention, vomiting, diarrhea and sometimes jaundice. **In the nervous type** the special symptoms vary considerably, common ones are: Severe headache, neuritis, sleeplessness, extreme nervous irritability, and mental disturbances, such as melancholia or dementia, may occur, or a meningitis may develop. Sometimes, especially **in severe infections,** symptoms of all three types may be present and, on the contrary, **in mild infections** the only symptoms may be those of a cold and pain in the limbs, and headache, but people infected by a person with a mild attack may develop a severe type of the disease.

In uncomplicated attacks of influenza the temperature usually falls by lysis after three or four days, but sensations of discomfort, soreness, and nervous irritability are likely to last for some time and, as the individual's power of resistance to infection is much reduced by influenza, other diseases not uncommonly follow or they may complicate the influenza.

Treatment.—The patient is put to bed in a cool, quiet room, visitors are not allowed. The measures to prevent infection when the virus is in the respiratory tract are taken. Drugs such as aspirin may be prescribed. Steam inhalations are usually ordered when there is much congestion of the respiratory tract. An ice-cap is used for headache. Turpentine stupes are used for the relief of abdominal pain and distention. Various vaccines and serums are used in severe cases. Water should be given liberally. The diet is generally confined to liquids, as milk, broths, and fruit juices during the febrile stage but, as this is not prolonged, it is not generally considered necessary to force the patient to take a large supply if he objects, however, as soon as the fever subsides, a

plentiful supply of easily digested nutritious food is given, for it is very important to build up the patient's strength as quickly as possible.

Acute Rheumatic Fever

Acute rheumatic fever is an infectious disease the most common characteristics of which are a sudden onset with marked febrile reaction, a non-suppurative arthritis (*inflammation of the joints*), a strong tendency to myocarditis and endocarditis which leave permanent cardiac damage.

Etiology.—The cause has not been positively determined, but an organism which some authorities describe as a micrococcus and others as a diplococcus, and have named *Diplococcus rheumaticus*, has been isolated from the blood and from the fluid taken from joints of persons with acute rheumatic fever, cultures of which, when injected into rabbits, have induced a non-suppurative arthritis and endocarditis similar to the conditions typical of rheumatic fever. Also these results have been obtained from streptococci isolated from the fluid obtained from affected joints. Therefore, many authorities believe that the virus of rheumatic fever is not a difinite organism, but that various strains of streptococci, the pneumococcus, or other organisms may undergo certain changes when they develop in diseased tonsils or other foci of infection and thereby acquire the properties necessary to induce the symptoms of rheumatic fever. Of the various possible foci (*e. g.*, abnormal tonsils, infected sinuses of the facial bones, alveolar abscesses, necrosed teeth, the appendix) the tonsils, it is believed, offer the most favorable conditions for the development of the organisms.

Predisposing causes of rheumatic fever are abnormal conditions of the tonsils, infected sinuses, conditions arising from exposure to cold and dampness. The disease is most common in the winter and spring. Children and young adults are more susceptible than older people. One attack does not confer immunity, in fact it favors recurrence.

The arthritis, heart affections, and other lesions are due to the actual presence of the specific organism in the affected tissues and the toxins there elaborated. In youth the virus seems to have a strong predilection for the heart and nerve tissues, for either or both cardiac lesions and chorea may occur without recognizable symptoms. In older people, on the contrary, the arthritis may be very severe without inducing cardiac complications and chorea practically never occurs from this cause.

Symptoms.—The rheumatism very frequently starts during or following an attack of tonsillitis. The onset of a typical case is generally marked by a sudden rise of temperature, which is sometimes preceded by a chill, "grippy" pains, and headache. Some of the large joints then begin to swell and become hot and extremely painful, but as a rul. not as red as when the inflammation is due to pyogenic bacteria. During the course of the disease all the large joints, and occasionally some of the small ones, may become involved, though not all at the same time, one of the typical characteristics of the arthritis associated with rheumatic fever being the subsidence of inflammation in one joint as another becomes involved. The muscles around the affected joints may become swollen, sore and tender. The temperature runs an irregular course, it usually ranges between 102° to 104° F., but in severe cases it may reach 105° F. and

over; its highest point is usually reached about the third or fourth day after which there is a gradual decline and in most cases the normal point is reached in from 10 to 14 days. As a rule, the pulse rate is at first proportionate to the temperature, but cardiac complications are likely to cause its acceleration. There is profuse diaphoresis and the sweat has an acid reaction and a sour odor. There will also be the symptoms usually associated with fever, *e. g.*, lack of appetite, coated tongue, constipation, scanty urine, malaise, and prostration. The prostration and weakness may be extreme and pronounced anemia tends to develop. There is usually a moderate leucocytosis.

Convalescence is slow and the joints may be stiff for some time after the other symptoms subside, but the arthritis generally disappears entirely. Rheumatic fever is rarely fatal, but its heart complications are frequently so.

Complications and Sequelæ.—The most serious complications are myocarditis, endocarditis, and pericarditis, the two first mentioned being the more common. In youth heart complications may be caused by very slight infections, it is quite common to find people with chronic cardiac lesions who say that they never had rheumatism, but that during childhood they frequently had severe attacks of growing pains, and, in such cases, it is believed that undoubtedly the growing pains were attacks of rheumatism and associated with slight infection of the heart. As will be seen in the section describing the diseases of the heart, mild attacks of endocarditis, etc., may produce few symptoms at the time, but they may nevertheless cause damage that will give trouble as the person grows older and the arteries lose their elasticity. Acute dilatation of the heart is not an uncommon com-

plication and it is the most frequent cause of death, this is described with the heart diseases. Tonsillitis was formerly considered a complication, but it is now believed to be, when present, the primary focus of infection. Chorea is often associated with rheumatic fever, but it is thought to be an independent infection of the central nervous system with the same germ and it frequently precedes the rheumatic symptoms. Pneumonia, pleurisy, and nephritis are rare complications. Occasionally small lumps, known as rheumatic nodules, appear under the skin along the tendons of the affected joint and sometimes these and chronic arthritis are permanent.

Prophylaxis.—The special prophylactic measure required is the maintenance of proper conditions of the mouth and throat, this includes the removal of diseased teeth and tonsils and adenoids. As one attack favors recurrences those who have had the disease must be particularly careful. The use of an oil spray, especially by those whose occupations expose them to the inhalation of dust or to close proximity with numbers of people, is sometimes advised for the oil protects the throat from irritation. Such individuals should avoid exposure to cold and wet as these conditions favor throat inflammations.

Treatment.—Absolute quiet in bed is essential until all rheumatic symptoms have disappeared and, if the heart is involved, cardiac compensation is established (described under Chronic Heart Lesions). This is essential in even the mildest infections in order to spare the heart all unnecessary work and thus allow of its energy being utilized to overcome the effects of the infection. It is believed that getting up too soon after the acute rheumatic symptoms subside is frequently responsible for the heart lesions. Flannelette nightgowns are usually

better than muslin ones, because they absorb moisture more readily and thus prevent chilling of the body by the rapid evaporation of the excess sweat from the surface of the skin. A bed-cradle is kept over inflamed joints to protect them from the weight of the clothes, which may cause great pain; pain will also be caused by the slightest movement or jarring of the affected limb. For the relief of pain hot air baths, light baths, and various forms of local applications are commonly prescribed. A commonly used local application is a wet dressing moistened with a saturated solution of magnesium sulphate. When this is used it must be kept constantly wet for, if the compresses become dry, the salt will be encrusted on the skin and cause irritation and the compress will be hard and stiff and cause pain. On the other nand care must be taken not to let the bed become wet for the movement entailed in changing the bed may cause great pain. Salicylates combined with an alkali, such as sodium bicarbonate, are usually prescribed and, as they are frequently used in particularly large doses, symptoms of overdosing must be watched for. During the acute stage the diet is generally restricted to milk, usually diluted with lime water, and simple milk preparations. Meat broths and meats, which contain more purin bodies than other foods, are not allowed until the acidosis is overcome, because the purin bodies yield the unoxidizable uric acid and therefore tend to increase the amount of acid produced in the system. As soon as the acute symptoms subside a liberal supply of nutritious food especially that relatively rich in iron, is essential. Tonics are generally prescribed to overcome the anemia and improve the appetite. If the joints remain stiff after the acute symptoms subside massage is generally prescribed. Children must be carefully watched and not

allowed to indulge in rough play or over exert themselves. This may be necessary for months and even years.

See Mon Dec 17

Epidemic Parotitis

(*Mumps*)

Parotitis or mumps is an acute contagious disease, **characterized** chiefly by inflammation of the salivary glands, chiefly the parotids, and sometimes other glandular structures, especially those of the genital organs, notably the testes in the male.

Etiology.—The cause is unknown, but it is supposed to be a filtrable virus. It is undoubtedly **contained** in the nasal and mouth secretions. The chief **method of contracting the disease** is by direct contact with the patient, but it is also transmitted by fomites and carriers. It is thought that bed-clothes, towels, handkerchiefs, etc., used by a person with mumps may retain virus as long as 10 to 20 days. The disease is **communicable from** the appearance of the first symptoms (possibly before this) until the enlargement of the glands and other symptoms have entirely subsided.

Mumps occurs most frequently in childhood, but adults are not exempt. One attack usually confers immunity.

The virus is thought to enter the body through the nose and mouth.

The period of incubation is between 10 days and 3 weeks.

Symptoms.—The onset is generally marked by chilliness and a rise of temperature, usually between 100° and 103° F. This is followed by swelling of one of the parotid glands, the swelling being observed below and in front of the ear. The swelling increases gradually and **in a day** or two the other parotid and the submaxillary

glands are likely to become swollen. Movements of the jaws are restricted and painful. The mouth is generally dry. Acid drinks and foods (*which stimulate free secretion of salvia*) cause pain. There may be tinnitus, earache, malaise, mild gastro-intestinal disturbances, aches and pains in the joints and limbs, but as a rule the constitutional symptoms are not pronounced unless complications occur. After a week or ten days the swelling and other symptoms generally subside.

Complications.—The sex glands are rarely affected in early childhood, but after puberty, in the male, orchitis (*inflammation of the testes*) is common, it usually shows itself 5 or 8 days after the onset. The female sex glands are less frequently involved, but occasionally there is inflammation of the ovaries, vulva, and mammary glands. Less common complications are: Nephritis, pancreatitis, otitis media, neuritis of the optic nerve, meningitis, suppuration of the parotid glands, chronic hypertrophy of the glands.

Treatment.—The patient should be kept in bed and, for at least three weeks, isolated. The disinfection usual when the virus is contained in the nasal and mouth secretions is required. A cathartic is generally prescribed at the onset and as often as necessary to prevent constipation. Hot fomentations over the infected gland are sometimes prescribed or else counterirritants. Water should be given freely. Liquid or soft foods that will not require movements of the jaws are used.

Pertussis

(*Whooping Cough*)

This is an infectious disease **characterized** chiefly by catarrh of the respiratory tract and a paroxysmal cough

that ends in a whoop; the latter being the result of a forced inspiration taken while the glottis is contracted as it is during coughing.

Etiology.—The exciting cause is the *Bacillus pertussis* present in the sputum and nasal secretions and especially abundant during the early stages. The disease can be transmitted by anything that becomes soiled with the nasal secretions and sputum and the droplets that are ejected in coughing, sneezing, etc.

The incubation period is uncertain, probably 2 to 10 days.

Symptoms.—There are three stages: (1) **The catarrhal stage** is characterized by congestion and hypersecretion of the nasal and bronchial mucosa, slight fever, dry cough, sneezing, and leucocytosis, especially of lymphocytes. This stage lasts about two weeks. (2) *The paroxysmal stage*, this is counted as beginning from the first whoop, its chief characteristic is the paroxysmal cough. During a paroxysm there is breathlessness, the face may become cyanosed, the eyes bulging, the veins distended, and vomiting and epistaxis are common. The severity and number of paroxysms vary greatly. The usual duration of this stage is about 3 to 4 weeks, but especially in the winter season it may last for 3 or 4 months. (3) **The stage of decline** in which the attacks become less frequent and violent and convalescence is established. It may last a week or 2 or 3 months.

Results.—The disease is frequently fatal to old people and young children and at all ages it is likely to give rise to various complications such as: ulceration of the under surface of the tongue, because of the irritation to which it is subjected by its paroxysmal protrusion during severe attacks of coughing; hemorrhage, especially from the nose or throat or into the conjunctiva, occasionally,

severe paroxysms cause cerebral hemorrhage; hernia; this is most likely to occur in infants or debilitated children; convulsions; bronchopneumonia.

Treatment.—Patients should be kept away from those who are not immune. If they have fever they are kept in bed, otherwise this is not usually necessary, but they should be kept fairly quiet and be guarded against anything that provokes coughing. During fine weather they should be kept out of doors as much as possible. The use of wool underwear is generally advised and of an abdominal binder for infants and debilitated children. Inhalations of creosote or similar volatile drugs that tend to improve the condition of the mucous membrane are sometimes prescribed, also cough medicines and tonics and sometimes vaccine. Proper feeding is of great importance.

Diphtheria

Diphtheria is an acute contagious disease that is **characterized by** (1) the formation of a false fibrinous membrane at the focus of infection and (2) systemic toxic manifestations, due to the effects of the toxin that is absorbed from the infective focus and carried about the body. It especially affects the heart and nervous system. **The most common sites of infection are** the throat and tonsils (*pharyngeal or tonsillar diphtheria*), but the larynx (*laryngeal diphtheria*), nose (*nasal diphtheria*), conjunctiva (*diphthereal conjunctivitis*), or other mucous membrane, or the surface of wounds may be the affected part.

Etiology.—The *Klebs-Löffler bacillus* is the active cause. Predisposing factors are (1) abnormal conditions of the throat and neighboring parts, (2) weather and living conditions that promote such affections, and (3) youth, the majority of cases occurring between the

ages of 2 and 12 years. The disease is transmitted by the secretions or discharges from the infected area and anything that becomes contaminated with these may be a source of infection. The organisms will usually have disappeared from their focus by the time the false membrane has disappeared, but they may persist for a varying length of time and frequently those who have been in contact with patients, but have not contracted the disease, may have the bacilli in their throats and thus serve as carriers. There is considerable difference of opinion as to the length of time that the germs thus retained by healthy people remain virulent, but it is believed that carriers, either contacts or convalescents, are frequently responsible for epidemics and that carriers should not be considered free from germs until four negative cultures have been obtained from secretions taken from the infected area.

The disease is transmissible from the time that infection occurs until, as a rule, all the Klebs-Löffler bacilli have disappeared.

One attack does not necessarily confer **immunity.**

The period of incubation is between 2 and 7 days.

Nature of the Specific Lesion.—In very mild infections the lesion may consist merely of a catarrhal inflammation but ordinarily a fibrous membranous exudate is formed. This consists of necrosed tissue, pus, and blood-exudates and it contains the Klebs-Löffler bacillus. The membrane is usually of a dirty gray color. At first it is firmly adherent to the mucous membrane and, if stripped off, will leave a bleeding surface which will soon be covered with a new exudate. Toward the termination of the disease this false membrane becomes softer, curls at the edges, and tends to come off in flakes, so that it can be easily removed.

(A membrane quite similar to the diphtheritic membrane is formed by some other bacteria, especially the germs causing follicular tonsillitis and some of those present in the throat during scarlet fever, but if the Klebs-Löffler bacillus is not present, the disease is not diphtheria and, on the other hand, if this organism is present, even when no typical membrane forms, the disease is diphtheria and the infected person may transmit the disease.)

Symptoms of Tonsillar and Pharyngeal Diphtheria.—The invasion may be mild or severe. It is usually associated with feelings of malaise, sore throat, chills or chilly sensations, or in young children occasionally convulsions, followed by moderate fever (102° to 103° F.–37.8° to 39.4° C.—) the course of which is likely to be irregular, but it nearly always remains low in proportion to the toxemia that is produced. The pulse is likely to be weak and rapid in proportion to the height of the temperature, but if the heart is affected, the pulse is likely to become slow (about 60 per minute) and extremely irregular. In severe infections there is likely to be dyspnea. The glands around the neck become swollen. The false membrane generally appears about the second or third day after the onset. General prostration, apathy, and pallor are then likely to be extreme.

Death not uncommonly occurs, in even moderately severe infections, as the result of heart failure, due to the degenerative conditions promoted in the heart muscle by the toxins. The duration of the disease in those who recover is variable, but the average time is from 10 to 14 days.

Laryngeal Diphtheria.—This form of diphtheria is known also as membranous croup, because of the croupy nature of the cough associated with it. When it is not associated with lesions on the tonsils the symptoms of

toxemia are not as pronounced as in tonsillar diphtheria, because there is less absorption of the toxins from the larynx, but the membrane in the larynx obstructs the passage of air to a much greater extent than it does when in the pharynx and thus coughing, dyspnea, and cyanosis are likely to be extreme, also the voice is exceedingly hoarse, and prostration, due to exhaustion from the forced breathing, may be intense and even fatal. However, the main danger in laryngeal diphtheria is suffocation from obstruction of the larynx. Shreds of membrane may be coughed up from time to time and this gives temporary relief.

Nasal Diphtheria.—This may occur as the result of the spreading of infection from the throat or as a primary infection. The special symptoms are a discharge from the membrane of the nose and, sometimes, attacks of epistaxis. The constitutional symptoms are the same as in pharyngeal diphtheria, but as a rule they are milder.

Complications and Sequel.—The most common complications are bronchopneumonia, heart failure, suppuration of the cervical lymph-nodes, otitis media, and nephritis. The most important sequel is paralysis of some part of the body, most frequently of the muscles of deglutition, due to neuritis resulting from injury of the nerves by the toxins. As a rule, the paralysis becomes evident during the second or third week of convalescence. The primary symptoms of paralysis of the muscles concerned with deglutition are difficulty in swallowing and regurgitation of liquid through the nose. Under proper treatment the paralysis disappears after a varying length of time.

Prophylaxis.—(1) A normal condition of the throat and nose is a valuable protection. (2) A prophylactic dose of diphtheria antitoxin received after exposure

lessens the chances of infection and, if infection does occur, inhibits the development of the false membrane and of the toxemia. (3) Patients and suspects should be isolated and the disinfection usual when the virus is in the throat and nose secretions carried out. (4) Those in charge of the patient should, for their own protection, wear glasses and cover their mouth and nose with a protector when giving the patient's treatments. (5) Carriers should remain under the physician's observation and undergo treatment until the germs have disappeared from the throat and nose.

Treatment and Nursing Care.—Diphtheria antitoxin is now almost universally used. At stated intervals the throat is douched with an antiseptic solution. This is considered better than swabbing, gargling, etc. After the diseased portion has been treated, the remainder of the mouth and throat must be carefully washed, clean swabs being used for the purpose. In nasal infections the nose is douched or sprayed. Hot applications to the neck and steam inhalations are commonly prescribed. It is usually advisable for a patient with laryngeal diphtheria to be cared for in a hospital because intubation or tracheotomy may have to be done in a hurry, sometimes quite unexpectedly. A very essential item in the care of diphtheria patients is to keep them as quiet as possible, because of the tendency to heart failure.

Cerebrospinal Fever

(Epidemic Cerebrospinal Meningitis)

Meningitis implies inflammation of the meninges. In cerebrospinal meningitis the meninges covering both brain and cord are involved.

Etiology.—A meningitis may be caused by any germ that produces inflammation if it reaches the central nervous system, but the type of meningitis classed as epidemic cerebrospinal meningitis is due to the *Diplococcus intracellularis meningitidis*. This germ is transmitted by the naso-pharyngeal secretions of patients and carriers. Infection takes place, it is believed, through the nose. Predisposing causes are: Abnormal conditions of the nose and throat, fatigue, ill health, and life in crowded, unsanitary quarters. Children are more susceptible than adults.

The period of incubation is uncertain.

Symptoms.—The course of the disease is variable and the symptoms vary somewhat so that at times positive diagnosis can only be made by finding the germ in the cerebrospinal fluid, which is obtained by lumbar puncture. In a typical case the onset is usually sudden, though there may be prodromal symptoms, such as headache, loss of appetite, and feelings of malaise. The onset generally begins with a chill or a convulsion, followed by fever, intense pain in the head, back, and limbs, and repeated attacks of vomiting that, after a time, may become projectile. More or less stiffening and contraction of the muscles soon becomes evident, particularly of those of the neck and back, so that in severe cases the head becomes drawn backward and the back stiff, and convulsive movements are common. The patient is likely to lie with the thighs flexed and, when they are in this position, the legs cannot be straightened, this is known as *Kernig's sign*. Another symptom due to stiffness of the muscles that is of importance in diagnosis is that known as *Brudzinski's sign*, this consists in the flexion and eversion of the legs and arms when an attempt is made to flex the head. There is hyper-

sensitiveness, this is seen especially in sensitiveness to light (*photophobia*). The pupils are usually dilated and only react sluggishly to light, they may be unequal. The temperature is usually high at the onset, but it is irregular in its course and indefinite in its duration. The pulse is variable, but it is usually slow in relation to the temperature. The breathing is about normal in the early stages but it is likely to become irregular and Cheyne-Stokes breathing is not uncommon. Restlessness and sleeplessness are to be expected. Delirium is common, in severe cases it is followed by stupor and coma. There is usually constipation and there may be retention of urine, the latter is likely to contain albumin. Skin eruptions are common, but there is no typical form. Sometimes there will be minute hemorrhages into the skin (*petechia*) which give it a spotted appearance. Herpes around the lips (*fever-blister*) is usual. If the disease is protracted emaciation may be extreme.

Cranial and spinal nerves are likely to become involved. Of the cranial nerves it is most commonly those of the eyes and ears that are affected. Evidence of involvement of those connected with the eyes is seen by the appearance of such conditions as nystagmus (*rolling of the eyeballs*), ptosis (*dropping of the lids*), strabismus (*squint*), inequality of the pupils, blindness. Involvement of the auditory nerve may cause deafness. Involvement of spinal nerves is shown by a primary hyperesthesia and tonic spasms and this may be followed by paresis of the muscles supplied by the affected nerves.

The usual duration of the disease is from 2 to 4 weeks but in malignant cases death may occur in a few hours and in what is known as the abortive type the acute symptoms may subside in a few days. On the other

hand a stuporous condition may develop and the patient remain thus for weeks or even months.

Treatment.—The measures to be taken to avoid acquiring and transmitting infection are those used when the virus is in the nose and mouth secretions. The general treatment is the same as for other febrile diseases. The special treatment is as follows: Lumbar puncture is usually performed at intervals to remove excess cerebrospinal fluid, because its pressure on the brain is partly responsible for some of the symptoms. Antimeningitis serum is introduced after the puncture, usually into the spinal canal, but sometimes into one of the lateral ventricles, or it may be given intravenously. Warm baths (about 106° F.) continued for 20 minutes or longer, are sometimes prescribed to be given two or three times a day and the patient must be supported on air pillows or in a hammock while in the tub. An ice-cap is generally kept on the head. Analgesics are prescribed to reduce pain and thus relieve restlessness and sleeplessness. It is very essential that the patient be kept quiet, and therefore the sick-room should be where he will not be disturbed by sounds, and it must be kept cool, though not cold.

Acute Anterior Poliomyelitis

(*Infantile Paralysis*)

This is an acute systemic infectious disease that tends especially to involve the central nervous system. It occasionally becomes epidemic. Epidemics most commonly begin in the summer and subside at the approach of cold weather. Children under five years of age are particularly susceptible.

Etiology.—The virus is thought to be an exceedingly minute anaërobic organism recently discovered by

Doctors Flexner and Noguchi. It is transmitted through the mouth and nose secretions of patients and carriers.

There are likely to be **two phases to the disease.** The first one being the result of the reaction of the system as a whole to the virus and the second the result of the virus on the central nervous system. The second phase does not always occur, when it does the symptoms vary according to the part of the nervous system principally affected. Depending upon this the **disease is classified** as: *Spinal*, in which there is paralysis of the legs or arms; *ascending*, in which the paralysis begins in the legs and extends upward until there is difficulty in breathing and swallowing and death is likely to result from asphyxia; *bulbar*, in which the medulla and pons are the parts chiefly affected, as is shown by paralysis of the muscles of the eyes, face, tongue, and pharynx; *cerebral*, which is marked by convulsions, vomiting, and paralysis of different parts; *meningitic* in which the symptoms are similar to those of meningitis; *neuritic*, which is associated with neuritis. When the second phase does not occur the disease is said to be *abortive*.

Incubation period 3 to 10 days.

Symptoms.—The symptoms of the first stage vary greatly in intensity sometimes being so slight that they escape recognition. Common ones are: Sore throat, restlessness, headache, fever, pain in the back and limbs, stiffness of the neck, vomiting, diarrhea, drowsiness, apathy, irritability. In severe infections the child dreads being touched and may cry out if he thinks he is going to be moved. He is likely to lie on the side with the head drawn backward and the knees bent. Even when in a stuporous condition he can be roused to a state of peevish irritability, but quickly returns to a somnolent state when left undisturbed. Especially in mild infections

the condition may improve after about a week or 10 days and convalescence occur, but at almost any time during the disease, sometimes after a few days of apparent convalescence, the symptoms of the second phase may appear. Most frequently it is chiefly the anterior horns of gray matter of the cord that are affected and, therefore, the spinal type of paralysis that occurs and the legs are the parts that most frequently suffer. The paralysis usually reaches its maximum in a few hours or days and then begins to improve; especially under proper treatment it is likely to disappear, but if any of the nerve cells have been injured beyond recuperation, the muscles they innervate will lose their tone, remain functionless, and gradually atrophy. If, as is very frequently the case, the opposing muscles have not been affected they, being released from the normal opposition of their antagonists, become overcontracted and draw the part in which they are inserted out of line, this and the atrophied condition of the paralyzed muscles causes deformities.

The mortality is between 4 and 25 per cent.

Treatment.—Isolate the patient in a quiet room. The disinfection and general care required are those used in other febrile infectious diseases in which the virus is in the respiratory tract. Special treatments and necessary care are: Anti-poliomyelitis serum is commonly used. Warm tub baths are sometimes prescribed to be given two or three times daily; the bath is usually continued for from 20 to 30 minutes and, while in the bath, the patient should be supported on air pillows. Lack of body support at any time may cause pain and therefore it is very essential that the mattress be firm and that, when necessary, pillows should be used to support the patient in a comfortable position. The usual means to prevent

bed-sores must be taken, there is special danger of their formation because the involvement of the nervous system is apt to interfere with the circulation. Care must be taken when moving the patient not to bend his neck or back for this causes pain. Watch must be kept for signs of paralysis. The weight of the bedclothes must be removed from paralyzed parts by the use of cradles or substitutes. Paralyzed parts must be kept warm by covering them with cotton and the use of hot water bottles. The parts are usually immobilized by the use of splints, but as soon as the acute process subsides they are given gentle massage, later corrective exercises are given and, if necessary, orthopedic applicances are used.

Varicella

(*Chicken pox*)

Varicella is a mild, acute, highly contagious disease that is characterized by slight fever and a typical eruption that in some respects resembles that of variola (smallpox) though the two diseases have nothing in common.

Etiology.—The virus, its port of entry, and means of transmission are unknown, but it is thought to be transmitted by fomites and flies as well as by contact with a patient. Children are more susceptible than adults. One attack generally confers **immunity.**

The incubation period is about 11 to 15 days.

Symptoms.—The invasion is usually mild; there may be chilly sensations followed by slight fever, possibly vomiting, and slight pain in the back and limbs. The eruption appears in about 24 hours, beginning on the back, face, or chest and it becomes most profuse on the parts that are usually covered by clothing. The mucous

membrane of the mouth, pharynx, larynx, and sometimes the external genitals may be the site of the first stages of the **eruption.** This passes through five stages, viz.: (1) Macules, which last but a few hours; (2) soft, superficial papules, which likewise are transitory; (3) rounded or oval, thin-walled vesicles that are filled with a clear fluid, (4) pustules, *i. e.*, the fluid in the vesicles assumes the characteristics of pus, these remain for a day or two, (5) the pustules dry forming superficial crusts which soon fall off. Pitting may occur, but the pits are few and superficial. The eruption appears in successive crops so that the lesions of the various stages are present at the same time.

Treatment.—There is no special treatment, except that the child should be kept somewhat quiet in a fairly warm room, and applications of carbolized vaseline or similar ointment are commonly prescribed to lessen itching. Scratching should be prevented, because irritation of the lesions tends to cause inflammation and thus increases the tendency to pitting.

Rubeola

(*Measles*)

Rubeola is an acute, highly contagious disease. Its specific **characteristics** are: (1) a catarrhal condition of the respiratory tract and sometimes of the gastro-intestinal tract; (2) an initial coryza; (3) a typical eruption which is followed by a mealy desquamation; (4) fever.

Etiology.—The active cause is unknown, but experiments have proved that the virus is contained in the nasal and bronchial secretions, the blood, and the urine.

Measles may be contracted by contact with the patient or with fomites, individuals coming in contact with the

patient may carry the virus on their clothing, and flies that become contaminated by alighting on things soiled with the infected secretions may transmit the infection. Clothing, bedding, toys, etc., that become infected may retain their infectiveness for as long as 10 days.

The danger of transmitting infection is greatest during the early stages of the disease, even during the period of incubation, and it is practically non-existent after the rash disappears. Children are more susceptible than adults. One attack usually confers **immunity.**

The period of incubation is from 1 to 2 weeks.

Symptoms.—The invasion is characterized by coryza, sneezing, hoarseness, lacrimation, redness of the eyes, and sometimes photophobia. The throat and tonsils become congested. The tongue coated, there may be a chill or chilly sensations. The temperature rises, usually to between 102° and 104° F. On the second day it may fall somewhat and remain relatively low until the eruption appears on the skin, it then rises to the height that it was previously or possibly slightly higher, it remains elevated for 3 or 4 days and then falls by rapid lysis or crisis. Also when the rash appears, there is usually a recrudescence of the other symptoms, the coryza and eye conditions become somewhat worse, and the tonsils and cervical and axillary lymph-nodes tend to become tender and swollen.

A form of eruption known as Koplick's spots may usually be seen in the mouth before the skin eruption appears. These spots occur chiefly on the cheeks, near the molar teeth. They look like small dark blotches with bluish-white specks in the center. **The skin eruption** appears on the third or fourth day, first on the face and neck, then on the back, and so on over the body.

The eruption consists of small red papules which tend to coalesce in rounded or crescentic-shaped groups, but they do not become confluent as in scarlet fever. The rash begins to fade the third or fourth day after its appearance and is followed by a mealy-like desquamation which may last for one or more weeks.

The temperature begins to fall and the other symptoms to abate as soon as the rash starts to fade and, as a rule, if there are no complications **convalescence** is generally fairly rapid. Nevertheless, a child should not be allowed to go to school and should be watched until the cough and all other residue of the disease have disappeared and nutrition and weight are normal, because the condition of the respiratory tract renders it particularly susceptible to infection.

Prophylaxis. Treatment and Nursing Care.—The patient should be isolated as soon as suspicious symptoms develop. The length of quarantine required in different states varies from 14 to 21 days. The usual disinfectant measures required when the contagium is in the mouth secretions and urine are to be observed.

Particularly essential points in the care of the patient are: (1) To protect the eyes from light, if the patient is too young to wear glasses it may be necessary to keep the room dark, but otherwise it is better to shield the eyes and let the sunlight into the room. (2) If necessary the eyes must be washed frequently enough to keep them clean; a non-irritant antiseptic, such as boric acid 2 per cent., is used for the purpose. (3) The mouth must be kept clean and pain in the ears must be reported to the physician at once, for otitis media is a common complication. (4) The room must be well ventilated, but warm (about 68° F.) and free from draughts, to obviate danger of the skin becoming chilled and thus increasing

the congestion of the respiratory tract. (5) The patient must be kept well nourished.

Rubella

(*German Measles*)

Rubella is a highly contagious disease that somewhat resembles measles, but is not identical with it and is a milder species of infection. Rubella does not confer immunity for measles and vice versa.

The causative organism is unknown, it is thought to be expelled in the nose and mouth secretions.

The period of incubation is about 10 to 14 days.

Symptoms.—The stage of invasion is usually so mild that it is hardly appreciated. There may be: Drowsiness, slight coryza, sore throat, swelling of the cervical and axillary lymph-nodes, pain in the head, back, and legs, a slight rise of temperature (100° to 101° F.) and an eruption appears on the first or second day. This may resemble the eruption of scarlet fever, but it more commonly consists of slightly elevated, bright red spots that have a round or oval outline, usually they remain separate and do not, as in measles, tend to form crescentic blotches. Similar spots may be present in the throat. In 2 or 3 days the eruption fades and is generally followed by a slight desquamation. Small pigmented spots remain for a time, but gradually disappear.

Treatment.—The patient should be kept quiet, though not necessarily in bed, in a warm, but well ventilated room and given light, nourishing food. Free catharsis should be effected. Dark glasses should be worn if the eyes are at all inflamed and, if necessary, the eyes and mouth are cared for in the same manner as during measles.

End

Scarlet Fever

(*Scarletina*)

Scarlet fever is an acute contagious disease that is especially characterized by a sore throat, a typical rash, and a marked tendency to nephritis.

One attack does not always confer **immunity,** but recurrences are rare.

Etiology.—The specific cause is unknown, but it has been definitely proved that the virus is in the nasal and throat secretions and not, as was formerly supposed, in the skin lesions.

The disease is transmissible from the beginning of incubation until the throat symptoms have all disappeared, which may not be until some time after all the other symptoms have done so. The virus is long lived and more resistant to unfavorable influences (such as heat, cold, sunlight, and drying) than most organisms. **Infection can be contracted by** direct contact with a patient, from fomites (bedding, toys, books, etc., that have been in contact with a patient or that have otherwise become infected), it can be carried by people, dogs, flies, etc., that have been within a radius of infection, because everything around a patient may be contaminated by droplets that are ejected when he coughs or sneezes. The way in which the virus enters the body is unknown, but it is thought that in some cases it does so through breaks in the skin.

Children are more susceptible than adults.

The period of incubation is from 1 to 7 days.

Symptoms.—The invasion is almost always sudden, *i. e.*, there are no prodromal symptoms. The onset is usually marked by vomiting, sore throat, pain in the back and extremities, children are likely to have convulsions

and adults chills, followed by a rapid rise of temperature. At the end of the first day or beginning of the second, a bright red **rash** appears, first, as a rule, on the neck and chest and the upper part of the face, and then it may spread over the entire body except, as a rule, on the chin and the outside of the mouth, though it may involve the roof of the mouth and throat, and the nasopharynx may be the seat of a fiery-red eruption. In mild cases the rash may not be so profuse, but may occur only in patches, generally on the face, chest, and around the joints. The eruption generally lasts for from 5 to 7 days and is followed by a flaky desquamation that continues for varying lengths of time, usually 1 to 7 weeks. It persists longest on the hands and feet and can sometimes be removed like casts from the fingers and toes. One of the typical characteristics of the rash is that it disappears on pressure and, if the point of the finger is drawn through it, a white line persists for a second or two. **The throat** generally becomes very much inflamed and painful and, in what is known as anginoid scarlet fever, a membrane that looks like that which forms in diphtheria may cover the tonsils and, sometimes, the tonsils suppurate. The neighboring **lymph-nodes** and sometimes those of the inguinal region become inflamed. **The tongue** is at first coated in the center and very red at the edges and tip, but later the coating may disappear and the papillæ of the tongue become swollen and bright red, producing the appearance known as "strawberry tongue." **The temperature rises** rapidly after the onset of the disease and usually reaches its maximum point (about 103° to 105° F.) in from 24 to 48 hours, it remains fairly constant for 3 or 4 days and then, in uncomplicated cases, gradually falls by slow lysis. **The pulse** is rapid, even in proportion to the

temperature, and the **breathing** quick and shallow. **Nervous symptoms,** such as delirium, restlessness, insomnia, and severe headache are common, especially before the rash appears. Convulsions may appear at any time during the disease, especially in children. They are sometimes the result of uremia, of which there is always danger if the kidneys become affected. There is a high **leucocytosis. Albuminuria** is common.

Complications.—The more common complications are: (1) nephritis, this seldom develops until the end of the second week or later, though albuminuria may occur in the early stages of the fever; (2) inflammation of the middle ear; (3) inflammation of some of the sinuses in the facial bones; (4) suppuration of the cervical lymph-nodes.

Treatment and Nursing Care.—Particularly important points in the care of the patient are those to prevent nephritis and infection of the ears, sinuses, and lymph nodes. **To lessen the chances of nephritis occurring** four measures are essential, viz., (1) to give water freely; (2) to exclude from the diet all unnecessary protein, especially meat extractives, therefore, even during convalescence, meats and meat broths are prohibited; (3) to keep the skin as active as possible, daily warm baths are given for this purpose, as well as to keep the skin in a good condition; (4) to prevent chilling of the skin, which would favor congestion of the kidneys, therefore the room must be kept warm (between 68° and 78° F) though well aired, and draughts around the patient must be avoided; (5) the urine is examined daily. **To prevent infection of the ears, sinuses, etc.,** the mouth must be kept clean.

If the eruption is associated with itching the skin is usually anointed with ointment after each bath. This is

also done during desquamation because it prevents scattering of the flakes of epidermis which is important for, though the virus is not eliminated in them, anything in contact with the patient's body may be contaminated.

Serum prepared from the blood of convalescents or of horses that have been inoculated with serum from convalescents is sometimes used.

Even after convalescence conditions that favor taking cold must be avoided, both because they may cause congestion of the kidneys and because a cold sometimes makes convalescents infectious again, it is thought that some of the virus remains for a time in the mucous membrane and is washed out when its secretions are increased as they are during a cold.

Prophylaxis.—Those who have been exposed to infection should remain away from children and crowded places until the incubation period is passed and take such precautions as gargling their throat with an antiseptic solution and, if their clothing was not properly protected at the time of contact, it should be disinfected. As soon as there is the slightest suspicion of symptoms the strictest isolation must be put into effect and maintained until all the throat symptoms have disappeared. Even after quarantine is raised the patient should not be kissed nor allowed to sleep with other children.

Syphilis

(*Lues*)

Syphilis is an infectious disease that tends to run a chronic course.

Etiology.—It is caused by the *Spīrochœta paillida.* The germ is contained in the lesions characteristic of the disease and therefore in discharges from such lesions and

secretions that have been in contact with them. Lesions in warm, moist parts of the body, such as the lips, the genitals, and under the breasts, are particularly likely to be infectious, because the warmth and moisture keep the germs active and at the surface; lesions covered with dry unbroken skin are not usually as dangerous. The disease may be contracted by the use of towels, bedding, and utensils that have been contaminated with infected discharge, but the spirochæta does not live long when freed from body tissue and is very quickly destroyed by drying, therefore personal contact is the **most common source of infection,** especially kissing, if the lesions are around the mouth, and sexual intercourse, and nurses have contracted the disease from the skin lesions while caring for syphilitic patients. The germ enters the body through breaks in the skin or mucous membrane, these breaks may be very small, however, even those present when the hands or lips are chapped will afford a channel of entry, and also the breaks caused in the mucous membranes of the genitalia during sexual intercourse. As syphilis is most frequently contracted during coitus it is classed as a venereal disease. During intrauterine life the fetus may become infected by the mother's blood. It is during what are known as the first and second stages of the disease that the patient is most infectious, but spirochætæ have been found in lesions occurring in what are known as the latent and tertiary periods and, therefore, open sores occurring at any time are to be considered infectious.

The period of incubation is usually about 4 weeks, but it may be somewhat shorter or longer. During the incubation period the germs multiply in the part where they found entrance and some may pass into the lymphatics in the vicinity of the lesion, also a few may enter the blood-stream and be carried about the body.

Symptoms.—Usually, the first sign of infection is the appearance of what is known as a chancre or a primary lesion, which develops at the point where the germs found entrance, this is followed in 2 or 3 weeks by enlargement of the lymph-nodes near the area of infection. The most typical form of **chancre** at first looks and feels like a small button under the skin or mucous membrane and, if the top is rubbed off, a raw ulcerating surface is left. It is slow to heal, but it is usually painless. Sometimes the lesion may be merely a small pimple, or a hard spot, or a chafed spot. These types likewise cause little or no pain and thus when a chancre is in a part where it is not observed its presence may not be discovered. The development of the chancre and the enlargement of the local lymph-nodes constitutes what is known as the **first stage of syphilis.** It is during this time that syphilis can be most readily cured by the use of drugs that destroy the spirochætæ.

If the germs are not destroyed during this time they multiply exceedingly and pass from the lymph-nodes where they have been detained into the general blood and lymph-streams and are carried about the body so that in from 4 to 12 weeks from the first appearance of the chancre, constitutional symptoms develop. The time during which these symptoms endure is known as the **second stage.** The symptoms vary considerably in nature and severity. There is probably always a rash, which may be rather diffuse, especially on the chest, abdomen, and face. The nature of the rash varies; it may consist merely of faint pink spots that are hardly noticeable, or of pimples, or pustules, or ulcerating sores. More than one type may be present. Some pigmented spots may form as the rash disappears. A syphilitic rash is rarely associated with itching, burning, or pain,

Sores on mucous membrane however may be tender and even painful and, especially those around the anus, cause itching. Peculiar white papules called **mucous patches** are likely to appear on some of the mucous surfaces, *i. e.*, the throat, lips, external genitals, urinary passages, and rectum. Sore throat (*pharyngitis*), laryngitis, and bronchitis are common. There may be swelling and pain in the joints, headache, anemia, loss of weight, and marked digestive disturbances. Iritis (*inflammation of the iris*) is not uncommon. The hair tends to fall out in patches. There may be some fever, especially when the rash is of a pustular nature. The spleen is often enlarged and there is usually leucocytosis and a more or less general enlargement of the lymph-nodes. The patient may be quite ill during this stage, but, on the other hand, the symptoms may be so mild that he is hardly aware of them and may not be conscious of having been infected, but even such slight infections may cause abnormal conditions in the body and give rise to what is known as the tertiary or third stage. After varying periods of time, even when no treatment is used, most of the bacteria are destroyed and the symptoms of the disease disappear for a time, this is known as the **latent stage.** Occasionally during this stage there may be a recrudescence of some of the symptoms characteristic of the second stage. The latent period may terminate in 2 or 3 months, or it may endure for 20 years or more. If proper treatment is carried out, and occasionally, though rarely, even without treatment, the germs may all be destroyed and no further trouble arise. If the germs are not all destroyed, sooner or later, the **tertiary stage** becomes apparent. This is due to changes caused in some of the organs by the invasion of the spirochætæ. The arteries, central nervous system, liver, kidneys, testicles, bone, and skin

are the parts for which the germ shows special predilection and it is usually one or more of these parts that are affected. The usual **underlying cause of the conditions characteristic of this stage** is the replacement of more or less of the normal tissue of the organ or organs affected by a soft gummatous tissue which in some parts assumes the form of small tumors, these are known as *gummata* (*sing. gumma*). The gummata in an organ may be very small and numerous, or as large as a hen's egg. The gummata and surrounding tissue may become degenerated and ulcerated and replaced by hard, inelastic scar tissue which contracts, thus making the organ smaller than normal, and sometimes nodules of scar tissue may be formed. The ulcerative process may destroy large portions of bone or other tissue. Common results of this are: The depression of the bones of the bridge of the nose and other facial deformities; destruction of the laryngeal cartilages and vocal cords and perforation of the hard palate; ulcers and other disfiguring lesions of the skin. Sometimes there are no external lesions, some of the internal organs being the only parts affected. **Conditions in the internal organs that are especially likely to occur are:** Arteriosclerosis (*hardening of the arteries*), which causes prematurely the conditions characteristic of old age and favors apoplexy and many other abnormal conditions; cirrhosis of the liver; chronic nephritis; gummata and softening of the brain, which may induce insanity, paralysis, blindness, deafness, etc.; degeneration of portions of the spinal cord which may cause locomotor ataxia; changes in the tissues of the stomach and intestines which give rise to chronic digestive disturbances.

When a woman with syphilis becomes pregnant, especially during the first five years after she has become

infected, she is likely to have a miscarriage, because she has still a number of free germs in the blood, which are likely to infect the fetus and cause its death. Sometimes, however, the fetus lives until about full term, it may then be stillborn, occasionally it is born alive, sometimes uninfected, especially if conception took place five years after infection, otherwise the infant's body is likely to be swarming with spirochætæ.

Congenital Syphilis

Syphilis present at the time of birth is said to be congenital.

Symptoms.—At birth the syphilitic infant is usually weak and thin, but the characteristic symptoms may not appear for a few weeks. These vary somewhat and are much more pronounced in some cases than others. Common ones are: The skull shows prominent frontal eminences and there is thickening, especially around the anterior fontanelle. A rash appears, it is usually erythematous in character, but sometimes papular or pustular. Mucous patches may form on the mucous membranes. There is usually a more or less purulent discharge from the nose, eyes, and ears, and in female infants from the vagina. The infant invariably has the snuffles, it becomes thin and marasmic, and looks old, and is likely to have a peculiar cry due to the condition of its throat. During this stage the infant is highly infectious. When such children live they are likely to be epileptic, idiotic or hydrocephalic, though some are quite bright. The first dentition is likely to be delayed and when teeth do appear they are often poorly developed and undergo decay readily. When the permanent teeth appear the upper central incisors are often conical and

notched at the tip (*Hutchinson's teeth*). Inflammation of parts of the eyes or ears may occur or of the nerves supplying these parts and cause blindness or deafness. Sometimes the child is born blind or deaf from prenatal involvement of these parts.

As in the case of acquired syphilis, gummata, in the form of small nodules may form in some of the viscera and much of the functional tissue of the organs be replaced by connective tissue. Various abnormal conditions of the bones are common and also periostitis (*inflammation of the periosteum*), which may result in the formation of what are known as periosteal nodes, *i. e.*, thickened nodules of periosteum, especially along the long bones of the arms and legs.

All the later conditions may be averted if it is recognized early that the infant has syphilis and the proper treatment is carried out.

The Wassermann Test.—*As the symptoms of both acquired and congenital syphilis may be very slight and ill-defined and the tertiary stage may simulate the symptoms of various diseases, it is often a very difficult matter for even the most expert diagnostician to be positive that a patient has syphilis, thus the discovery by Wassermann, Neisser and Bruch of a test that, while not infallible, is a great aid in diagnosis was a very valuable one. This test, known as the* Wassermann test, *is also used to determine if treatment has been effectual and, in order to prevent the development of the tertiary stage, treatment has to be continued until the test shows that all the spirochætæ have been destroyed. The test is too complicated to be described here, but will be found in all modern books of Bacteriology.*

Treatment.—The chief essential in the treatment of syphilis is the use of drugs that it has been found will destroy the spirochætæ. These are mercury and

arsenic, especially certain new preparations of arsenic such as salvarsan and neo-salvarsan. One injection of either of these preparations may cause the disappearance of all the external syphilitic lesions and thus the drugs are of great benefit, not only to the patient, but to prevent infection of others, since it is chiefly by the external lesions that the disease is transmitted. It may however require a number of injections given at intervals for from 2 to 5 years, or even longer, to destroy the spirochætæ that are hidden in the internal organs. In the third stage iodides are used, in addition to the arsenic and mercury, because they cause the disintegration of the gummata and this sets the enclosed spirochætæ free to be acted upon by the specifics.

Prophylaxis.—The most important prophylactic measure that an infected individual can take for the good of others is to receive a dose of neosalvarsan or salvarsan and thus be rid of the external lesions. While there are superficial lesions, all sheets, towels, etc., used by the patient should be disinfected or boiled before being sent to the laundry, also his dishes, spoons, etc., should be boiled. Those caring for the patient should watch their hands for cuts or scratches and if such are present cover them with colodion and they should wear rubber gloves when giving treatments to parts on which there are lesions, or, if this is not possible, cover their hands with soap, which has a strong germicidal action on the spirochætæ.

Gonorrhea

Etiology.—Gonorrhea is an infection caused by the *Diplococcus gonorrhea* usually referred to as the *gonococcus*.

The genito-urinary tract is the most common **primary focus of infection**, next to this the eyes, occasionally the nasal and buccal mucous membranes. The germs may be absorbed from a primary focus by the blood and cause serious inflammation in parts in which they are subsequently deposited, the heart, joints, or peritoneum are particularly likely to be affected.

Infection takes place as the result of contact with discharges containing the gonococcus. In adults, infection of the genito-urinary tract almost always occurs during sexual intercourse, but it may occur by the use of toilets, towels, bed-clothing, etc., that have been used by infected people. Children are particularly susceptible to infection and a number of girl children in hospital wards have at times been infected by the use of a bed-pan used by a child with gonorrheal vaginitis in whom the condition had not been recognized. Infection of the eyes has been traced to the use of towels soiled with infective matter and a number of nurses have acquired eye infections while caring for patients with gonorrheal vaginitis, presumably by getting the virus on their hands. As gonorrhea is most commonly contracted by sexual intercourse it is classed as a venereal disease.

Gonorrheal infection promotes inflammation that may or may not be associated with suppuration. If the inflammatory process is at all severe cicatrices and adhesions are likely to form. It is said that about one-fourth of all cases of blindness are due to gonorrheal conjunctivitis and about one-third of the operations performed on the internal genital organs of women are required because of conditions promoted by gonorrheal infection. The conditions produced in both male and female genital organs are likely to cause sterility. The duration of the inflammatory process varies; if treatment

is started early it may be overcome within about 2 months, but it may endure much longer. The length of time that a person may continue to transmit infection has not been definitely proven.

The special points in the treatment of gonorrhea are the local application of silver preparations and the irrigation of parts that can be so treated and the use of vaccines.

As a prophylactic measure, to prevent infants contracting gonorrheal conjunctivitis, should they become infected during birth, it is now customary, as soon as a new-born infant's eyes have been cleansed to instill one drop of a 2 per cent. solution of silver nitrate. Of course in the majority of cases this is not necessary, but the nitrate does no harm to the eyes and gonococci may be present in the birth canal and infect the infant's eyes after all symptoms of the infection have subsided and in some cases these are so slight that they are not recognized. This treatment is known as the Credé treatment because it was first advised by a Doctor Credé.

Septic Diseases

Septicemia and Pyemia

Septicemia or bacteriemia is a condition associated with the presence of bacteria and their products in the blood. The germs most commonly responsible are the streptococcus pyogenes aureus, or the staphylococcus pyogenes aureus, but others, especially the diplococcus pneumonia, the bacillus influenza, the coli communis, and the gonococcus are sometimes the cause.

Etiology.—Septicemia due to pyogenic bacteria is usually the result of either (1) the infection of wounds or

of the uterus during or following parturition; (2) the absorption of germs from a focal infection, *e. g.*, a suppurative lesion in the tonsils, facial sinuses, mastoid, appendix; (3) the introduction of germs under the skin with an infected implement, septicemia is particularly likely to occur from this cause when the local lesion is not opened and properly drained. Gonococcus septicemia usually follows gonorrheal infection of the urinary or genital organs and the other types are generally secondary to the disease ordinarily induced by the causative organism.

Symptoms.—These naturally vary somewhat in different infections. The most typical ones are seen in pyogenic infections and are about as follows: The onset is marked with chilliness or chills which usually vary in severity in proportion to the seriousness of the infection. The primary chill is followed by a rise of temperature, in mild cases, to about 102° F., but in severe infections to about 104° or even 106° F. It continues high, but with daily remissions and sometimes marked intermissions. The pulse soon becomes rapid, soft, and compressible. Extreme prostration, jaundice, and diarrhea are common. The mind may remain clear, but delirium is common. There is usually a high leucocytosis. In severe attacks petechia (described in Chapter VIII) are likely to appear under the skin and, if death does not occur by the second or third day a typhoidal condition (described under Typhoid) is likely to develop. When this is the case death usually follows though sometimes not for 2 or 3 weeks and occasionally recovery occurs. In mild infections the symptoms are less pronounced and may soon subside if proper treatment is started early.

Treatment.—This consists in (1) Surgical measures to cleanse the focus from which the germs are being

absorbed; (2) the injection of vaccines, autogenous ones are prepared for the purpose when possible; (3) the usual treatment in febrile conditions from other causes.

Pyemia resembles septicemia plus the formation of multiple abscesses, or septic processes such as endocarditis, as the result of septic embolism and the deposition of germs in the parts that become affected. These may be superficial or in any of the internal organs.

Symptoms.—These are the same as those of septicemia plus the occurrence of chills followed by a rise of temperature at irregular intervals during the course of the disease. It is believed that a chill is associated with an embolism or the starting of a new abscess. Sometimes death occurs in a few days, but the condition may be prolonged for weeks and, during the time, there may be frequent alternate periods of improvement and recrudescence due to a new embolism. In such case emaciation and prostration become pronounced and death from exhaustion is likely to occur, though recovery is not infrequent, especially if sufficient food can be taken to maintain the strength.

Sapremia

Etiology.—Sapremia is due to the absorption of the products of the decomposition of tissue, blood clots, or wound discharges that is brought about by putrefactive bacteria. Sapremia probably **occurs most frequently** (1) when pieces of placenta, blood clots, etc., are left in the uterus after parturition, (2) in badly lacerated wounds that are not properly cared for.

Symptoms.—The onset is generally sudden and is usually marked by a chill that is followed by a rise of temperature to from 102° to 104° F., a rapid full pulse,

increased frequency of breathing, headache, nausea, anorexia, thirst, coated tongue, flushed face, and scanty urine; in other words there is fever and its concomitants. Also there is likely to be pain in the focus from which absorption is taking place and chills may occur at intervals during the disease. The prognosis is favorable if treatment is started early.

Treatment.—This consists in the removal of the material undergoing decomposition, the thorough cleansing of the wound or cavity, and the usual care required in fevers and surgical diseases.

Erysipelas

(St. Anthony's Fire)

Erysipelas is an infectious disease that is **characterized by** (1) a peculiar inflammation of the skin or mucous membranes that does not, except sometimes in severe infections, tend to suppurate; (2) constitutional symptoms. The latter are generally due to absorbed toxins, because the causative organism usually remains localized.

Etiology.—Erysipelas is caused by the *Streptococcus erysipelatus* which, it is believed, gains entrance through wounds or abrasions. In what is known as idiopathic erysipelas, which most frequently occurs on the face, there may be no abrasion visible, but it is thought that very minute breaks in the surface will allow of infection.

The disease is acquired by contact with the patient or anything that has been in contact with the inflamed area. Also, the infection may be carried on the hands of a third person, *e. g.*, a doctor or nurse. Persons who suffer from recurrent attacks probably harbor the germs.

Infections sometimes occur in wounds, in the uterus after labor, and around the navel of a new-born child and

these are more serious than idiopathic infections because the germs may be absorbed from such localities by the blood or lymph and they are then likely to cause septic inflammation in some of the internal organs and sometimes a general septicemia. This does not often occur in idiopathic erysipelas.

One attack does not confer **immunity.**

The period of **incubation** is from 3 to 7 days.

Symptoms.—There may be prodromal symptoms of malaise and of tingling and itching in the part that later becomes inflamed, but in most cases the chill, which usually marks the onset, is the first symptom. The chill is followed by a rise of temperature, sometimes to 104° F. and over, and the usual concomitants of fever. The first sign of the local lesion appears very soon after the onset. It consists of a red patch with a sharply defined outline. As a rule, when the face is the part involved, the lesion generally shows first on or around the nose. The size of the patch increases rapidly, its edges become raised and hard, the surface red, tense, itchy, and painful, and it pits on pressure. Blebs may form and, in severe infections, abscesses. The part becomes enormously swollen and, when the face is involved, the eyes may be closed and the cervical lymph glands enlarged. Occasionally the inflammation spreads to the nasal cavities, pharynx, and larynx. In severe infections the inflammation may spread over a considerable portion of the body and the toxemia is then likely to be excessive. The temperature may reach 105° F. or over and a typhoidal condition (described under Typhoid) is likely to develop. There is usually a marked leucocytosis.

In favorable cases, *i. e.*, when the spread of inflammation is not excessive and suppuration does not occur, the average duration of the disease is from 10 to 14 days.

After about 4 to 5 days the inflammation begins to subside, desquamation follows, and the temperature falls, either by crisis or rapid lysis. Relapses are common however. Death from idiopathic erysipelas is not common, except in the aged and debilitated.

Complications.—These are not common except when the inflammation takes place in wounds and the other conditions previously mentioned, but septicemia, endocarditis, nephritis, meningitis, arthritis, or edema of the larynx may develop.

Treatment.—The treatment is the same as for other febrile diseases, plus the use of local applications to allay pain and itching. No one with a wound should be allowed near a patient with erysipelas and the nurses must be very careful to cover any scratches or abrasions on their hands with collodion. They should not go near those with wounds, nor pregnant nor parturient women, nor infants. A nurse should not go to such patients for at least a week after leaving an erysipelas patient without notifying the doctor that she has been exposed to infection and she should take nothing with her that she had while with the erysipelas patient that has not been sterilized.

Important Diseases of the Blood and of the Organs of the Vascular System—Diseases of the Blood

Anemia

Anemia is a condition associated with diminution of either the total amount of blood in the body, or of its red cells (*erythrocytes*), or of the amount of hemoglobin in the red cells.

Anemias are classified as (1) secondary or symptomatic and (2) primary or essential, and there are two types of the latter class, viz., pernicious anemia and chlorosis.

Secondary anemia is most commonly due to either (1) loss of blood, this may be the result of a single copious hemorrhage or of repeated loss of small amounts, such as may be caused by hemorrhoids, gastric ulcer, the presence of hookworms or similar parasites, hemorrhagic diseases, etc.; (2) factors that cause hemolysis (*i. e., excessive destruction of red cells*), such as bacterial toxins, excessive amounts of certain drugs, some abnormal condition of the spleen; (3) defective formation of the blood elements, this is common when there is general debility from any cause, *e. g.*, chronic diseases, deficiency of nutritious food.

When anemia is due to a copious loss of blood or the rapid destruction of red cells the most persistent feature is a deficiency of hemoglobin, because, in such case, the red cells are formed more rapidly than their hemoglobin and thus the newly formed cells, for a time, have not their normal amount. This condition is usually expressed by saying that the **color index** is below unity.

Symptoms.—The symptoms of secondary anemia vary according to the degree of deficiency of hemoglobin for they are dependent upon the lack of this substance, which is both the coloring and the oxygen-carrying matter of the blood. If the condition becomes at all pronounced there will be: Pallor of the mucous membranes, a tendency to drowsiness and mental torpidity (*the brain being one of the organs most readily affected by a lack of oxygen*) lassitude, sensitiveness to cold, there may be tinnitus (*the auditory nerve-endings are always likely to be stimulated by changes in their blood supply*), and, when the

condition becomes pronounced, there may be dyspnea on exertion and syncope is readily induced. If the condition is not ameliorated there will soon be evidence of malnutrition, because the body's normal metabolic reactions cannot proceed properly when its oxygen supply is curtailed. When in this condition an individual is extremely susceptible to infection.

The symptoms of an acute anemia due to a copious loss of blood are those of hemorrhage and are described in Chapter VIII.

As the **primary anemias** *are not common space will not be taken for their description. Their cause is unknown, pernicious anemia is usually associated with abnormal conditions of the bone marrow and sometimes of the spleen, no cure for the condition is known, most patients dying in from 6 months to 2 or 3 years. Chlorosis is thought to be due to some unknown condition which makes the blood-forming organs unable to meet the extra demands made upon them at the time of puberty. It occurs almost entirely in young girls. The principal symptoms are those of a profound anemia and a greenish, wax-like appearance of the skin. It usually yields promptly to proper treatment.*

Treatment.—In all forms of anemia important items of the treatment are: The use of an adequate amount of nutritious easily digested food in order to bring the weight back to normal; as the appetite is likely to be poor it is usually necessary to use foods that have a high caloric value in proportion to their bulk, also foods that contain the largest amounts of iron are to be chosen. Tonics containing iron and arsenic are generally prescribed. While the symptoms are acute rest in bed, massage, and hydrotheraphy are usually advised, at other times moderate exercise and life in the open air.

Hemorrhagic Diseases

Hemorrhagic diseases are those associated with an abnormal propensity to bleeding. There are two fundamental types, viz., hemophilia and purpura.

Hemophilia

Etiology.—The cause is unknown, but is supposed to be come abnormal condition of the thrombocytes (blood-platelets) which prevents them supplying the blood with the thromboplastic substances necessary for its clotting which, normally, they yield when disintegrated. The condition is hereditary. Females are only affected when both father and mother are hemophiliacs, but they transmit the condition to their male children. For example, if a man is a hemophiliac his daughters will not be, but their male children are likely to be.

A hemophiliac may bleed to death from a small cut, or after the extraction of a tooth, or other slight injury and thus it is only with care that hemophiliac children survive. When they do, they may outgrow the tendency to hemorrhage. On the other hand, the tendency is sometimes not marked in youth and only becomes apparent in adult life.

Treatment.—Children with hemophilia should not be allowed to indulge in rough play and all causes of trauma should be avoided. It is particularly essential that they be kept in good health because the tendency to bleeding is increased when their health is depleted. Styptics, *i. e.*, silver nitrate and perchloride of iron, should always be at hand and applied immediately if a wound is made and the other means to check hemorrhage, described under emergencies, must be taken at once. If these are

not successful the physician sometimes injects horse serum into the blood, for this favors coagulation, or human blood, which contains the essentials for clotting, is sometimes used, and also the intramuscular injection of drugs that favor clotting.

Purpura

There are a number of **types** of purpura that are classified under two main headings, viz., purpura hemorrhagica and simple purpura.

Purpura hemorrhagica is associated with diminution of the thrombocytes (*blood-platelets*). It may occur as a primary disease (*idiopathic purpura*) or as a secondary or symptomatic condition in the course of other diseases, such as pernicious anemia, leukemia, diphtheria.

Idiopathic purpura occurs at all ages, but it is most common between the twelfth and twenty-fifth years.

Symptoms and Course.—Hemorrhage from the mucous membranes is the most characteristic feature. The hemorrhage varies in intensity from a slight oozing to a copious bleeding. It may occur from any part of the respiratory, gastro-intestinal, or genito-urinary tracts, but most commonly it is from the nose (*epistaxis*) and gums and, next to this, the gastro-intestinal tract. In severe cases bleeding into the internal organs may also occur. The onset of the bleeding may be abrupt or it may be preceded by a period of indisposition. When the bleeding is severe it may terminate fatally in a few hours. In less severe cases attacks of oozing may continue for hours, days, or weeks and then subside or it may last until the patient dies of exhaustion. A patient who recovers may show no further signs of the disease, but recurrences are common.

Treatment.—The patient must be kept at absolute rest in bed and appropriate means taken to allay the bleeding. If those ordinarily used to check hemorrhage are not successful the transfusion of human blood is sometimes performed and drugs that favor the coagulation of blood may be prescribed. After recovery the patient is treated for anemia.

Simple Purpura.—This term is applied to those forms of purpura that are not associated with diminution of blood-platelets. They are characterized especially by slight bleeding into localized areas of the skin and mucous membranes and, in some cases, the excessive transudation of fluid from the blood-vessels, but there is no outward bleeding, as in hemorrhagic purpura. When bleeding occurs into the skin it gives rise to discolored spots similar to those seen in a bruise. Small spots of this kind are known as *petechia* or *purpuric spots* and larger ones as *ecchymoses.* Simple purpura may be either primary (this is also known as idiopathic) or secondary to various diseases, such as severe attacks of measles, and smallpox, cerebrospinal meningitis, acute rheumatic fever, and diseases that interfere with nutrition.

The cause is in many cases unknown, but it is believed that it is sometimes due to excessive permeability of the blood-vessels and that, in some cases, this is the result of changes in the normal inorganic constituents of the blood. Purpura occurring in the exanthemata, it is thought, may be due to the same conditions that cause the rash, but these in most cases, are not definitely known. Formerly, when smallpox and measles were more virulent than they are at the present day, they were frequently complicated with purpura, in which case the diseases were known as *black smallpox* and *black measles.*

The treatment depends upon the associated conditions.

Thrombosis and Embolism

By thrombosis is meant the formation of a thrombus A thrombus is generally defined as *a solid mass formed during life, in the heart or blood-vessels from blood constituents that, in the case of the vessels, causes a partial or complete occlusion.* If a thrombus is swept into the blood stream and carried to other parts of the body it is known as an embolus and the process is known as **embolism.** An embolus is defined as *a foreign substance that lodges in any part of the circulatory system when borne thither by the blood or lymph streams.*

Formerly, thrombi were thought to **consist of** blood clots, but the present theory is that, though possibly some thrombi and, more commonly, emboli may be clots, the majority of thrombi consist of material that has been deposited from the blood, but not clotted.

Thrombosis may occur in all parts of the circulatory system—the heart, arteries, capillaries, veins—but it occurs most frequently in the veins; emboli however are very likely to lodge in arteries.

The more common causes of thrombosis in the vessels are: (1) Interference with the blood flow; (2) changes in the blood constituents; (3) abnormal conditions of the endothelial lining of the blood-vessels.

Thrombosis and embolism occur most frequently: (1) Following surgical operations, (2) following parturition, (3) as a complication or sequel of infectious diseases, (4) in connection with abnormal conditions of the blood-vessels, (5) as a complication of constitutional diseases that induce cachetic states, (6) the entrance of air into a blood-vessel may induce what is known as air embolism.

The results of thrombosis and embolism will depend

upon such factors as: (1) the nature of the thrombus or embolus especially if it is sterile or septic; (2) the degree to which the affected vessel becomes occluded; (3) the degree of resistance of the tissue to the lessened blood supply; (4) the size of the vessel; (5) the nature of the vessel, vein or artery; (6) the presence or lack of anastomosing vessels.

Anastomoses, it will be recalled, are branches, venous or arterial, that unite at their distal ends, thus providing a channel of communication between neighboring vessels and, thereby, affording what is known as a *collateral* and as a *compensatory circulation*, so that, if one vessel is blocked, the blood can pass through other vessels supplying the same area of tissue. An artery that has no anastomosing vessels is known as an end-artery. Nearly all veins, and most of the arteries outside the skeleton, have numerous anastomoses, but in the viscera there are many end-arteries. Occlusion of an end-artery is more serious than that of one with numerous anastomoses, except in the case of some of the large vessels since occlusion of an end-artery shuts off blood from all its branches and the capillaries beyond the point of the plug and, as there will be no compensatory circulation, the tissues of the area supplied by the occluded artery will necrose. This condition is known as an *infarct*. **Infarcts** may be as small as a pea or they may involve a large portion of an organ. If suppuration does not occur, and the necrosed area is not extensive, the necrosed tissue may be gradually disintegrated and absorbed and replaced by connective tissue, which does not require as liberal a blood supply as the more active tissues. A large infarct, however, is likely to interfere with the functioning of an organ and even to cause toxemia and death.

Symptoms.—The symptoms of thrombosis and embolism are very similar, as a rule, the only marked difference being that, as the formation of a thrombus is usually gradual, the onset of symptoms in thrombosis is likely to be relatively slow, while, as the lodgment of an embolus is sudden, the onset of symptoms in embolism is sudden, except when the embolus does not completely block the vessel. The occlusion of a small vessel may cause no symptoms, but that of a large one, or even a moderately large end-artery, is likely to be marked by a chill that is followed by a rise of temperature (the reason for these symptoms is not understood) and pain, due to the distention of the vessel and, in the case of embolism, the impact of the embolus. The special symptoms occasioned by the occlusion of the vessels that are most commonly affected are as follows:

The occlusion of a large vein in a limb will cause intense pain, soreness, tenderness, and stiffness of the affected portion of the limb and, after a short time, edema develops, especially in parts below the obstruction. The acute symptoms usually subside in a few days, but the edema may persist for a considerable length of time.

Occlusion of a large artery in a limb will cause severe pain, this may disappear in a few days, pulsation will not be felt in branches of the affected artery below the point of obstruction, and the parts supplied with blood from the occluded artery become white, cold, numb, and sore, and those muscles in which the blood supply is limited lose their tone. The after effects will depend upon the degree of compensatory circulation that can be established, this may be sufficient to prevent bad results, sometimes permanently, sometimes for years, but if the tissues do not get sufficient nourishment they will die and thus gangrene of some portion of the distal end of a

limb in which an artery is obstructed is to be apprehended; it is more likely to occur when it is a vessel in a leg that is affected, as is most commonly the case.

Embolism or thrombism in a cerebral vessel is likely to have about the same effects as cerebral hemorrhage (apoplexy). **Embolism in a coronary vessel** is likely to be followed by instant death. **Embolism in a pulmonary vessel** usually gives rise to a sudden intense oppression in the chest, pain, dyspnea, pallor or cyanosis, dilatation of the pupils, cold sweat, and a weak, rapid pulse, and death may occur in a few minutes or hours. In some cases however the symptoms of shock are less pronounced and symptoms similar to those of pneumonia and pleurisy appear. Even such modified results of pulmonary embolism are serious, though recovery does occur. **Occlusion of an important mesentery vessel** is generally followed by acute collicky abdominal pain, vomiting, either profuse diarrhea or constipation, abdominal distention, and shock and, if an operation is not performed and the affected part of the intestine successfully resected, death occurs in a few days. **Obstruction of a renal vessel** is usually associated with severe pain and tenderness in the lumbar region and there may be urinary symptoms, but these vary.

If a thrombus or an embolus contains pyogenic bacteria an abscess is likely to form in the part in which it lodges and then symptoms of sepsis, as well as those due to the occlusion of a vessel, may occur.

Air Embolism.—The entrance of air into a vessel may be followed by great dyspnea, pallor, dilatation of the pupils, collapse, and sometimes convulsions, and death has frequently resulted. In autopsies on fatal cases the right side of the heart has usually been found distended with frothy blood. Air is most likely to be introduced

during douching of the puerperal uterus. and at the termination of an intravenous infusion, but it has occurred in the course of operations when the air has been drawn into the vessels during inspiration.

Prophylaxis and treatment.—Many physicians believe that as a prophylactic measure to prevent thrombosis of the legs during typhoid and following abdominal operations a patient's position should be frequently changed and the patient encouraged to move his legs and thus further the venous circulation. The usual treatment for thrombosis of a leg is to keep the affected limb elevated upon a soft pillow, avoiding pressure on the affected part, and the leg must be kept very quiet, to lessen the danger of embolism. Either hot or cold external applications are sometimes prescribed, if a hot-water bag or an ice-cap is used, it must not be filled sufficiently to make it heavy. The patient is kept in bed for at least 2 weeks after the temperature has become normal and all tenderness has disappeared and, when he first gets up, the legs must be immobilized and kept in a horizontal position. This must be done until the swelling has subsided. Hot air baths are often prescribed when the obstruction is in an artery of one of the limbs. The treatment of visceral obstructions is similar to that of inflammations of the affected organ. In all types of thrombosis the utmost care must be taken to keep the patient very quiet to lessen the danger of embolism.

Arteriosclerosis

The term arteriosclerosis implies hardening of the arteries. It is applied to a condition in which some or practically all of the arteries are thicker, harder, and less elastic than normal.

Arteriosclerosis is a natural outcome of old age, but normally it is not marked until between 60 and 70 years of age. Sometimes however **arteriosclerosis develops prematurely as the result of** either (a) an inherited tendency, (b) injury to the arteries by disease or mode of life. **Diseases that particularly favor premature arteriosclerosis are:** syphilis, diseases of metabolism, as diabetes and gout, chronic nephritis, valvular diseases of the heart. Also it is believed severe attacks of some of the more virulent acute infectious diseases may at times cause changes in the arterial walls that predispose them to early sclerosis. **Injury to the arteries by disease may be the result of either or both** mechanical strain resulting from increased blood pressure or the action of abnormal substances in the blood. **Modes of living that are thought to favor premature arteriosclerosis are:** those in which strain, either mental or physical, is unusually severe; intemperance in eating, especially of foods rich in protein; sedentary habits, which interfere with metabolism and elimination; also, it is thought possible that alcoholism and occupations that lead to chronic lead poisoning may act as predisposing causes.

Symptoms.—These vary considerably, depending upon the arteries affected and the degree of sclerosis. If the blood pressure is not unduly high, subjective symptoms may be absent for a time and they may never become unduly pronounced, this is especially the case with uncomplicated senile sclerosis (that due to old age), which develops slowly and allows the heart to become gradually accustomed to the extra work it has to do to force the blood through the sclerotic vessels. **In premature arteriosclerosis common symptoms are:** general failure of the health; pallor of the skin due to the contraction of the superficial blood-vessels. If the coronary arteries

are affected there will be dyspnea, especially on exertion, and attacks of angina pectoris are common and also symptoms due to mitral insufficiency and even cardiac dilatation (described under chronic diseases of the heart). The kidneys are likely to become affected and chronic interstitial nephritis to result. Various nervous symptoms due to defective circulation in the cerebral vessels are also common, *e. g.*, mental irritability or depression, headache, vertigo, tinnitus.

Sequels.—Some of the more common consequences of arteriosclerosis are: cerebral hemorrhage (apoplexy), chronic disease of the heart, aneurysm, interstitial nephritis, gangrene of the extremities.

Treatment.—The aims of the treatment are to stay the advance of the sclerosis and avoid bad effects from the impediment to the circulation caused by the existing sclerosis. Thus it includes treatment of the causative condition, means to improve the general health, and insistence on a mode of life that will avoid strain upon the heart, the same precautions being necessary as those described in chronic heart diseases.

Aneurysm

An aneurysm is a sac formed by the localized dilatation of the wall of an artery which produces bulging upon the external surface of the vessel. Aneurysms vary in **size** from exceedingly minute dilatations on small vessels to huge tumors. **The sac is filled** with blood which may be in either a liquid or a solid state. The latter, except in the case of very small aneurysms, is the more dangerous. **Large aneurysms form chiefly** on the aorta, especially the arch.

Etiology.—Aneurysms occur at all ages, but most frequently between the ages of 30 and 50. They are us-

ually the result of excessive arteriosclerosis and. therefore, of the conditions causing the sclerosis, especially syphilis. Many authorities believe that large ones only occur in those who have, or have had, syphilis. Habitual intense muscular exertion acts as a predisposing cause and exertion is the most common exciting cause when the vessels are sclerotic.

Symptoms.—Small aneurysms may produce no symptoms, in fact, death from internal hemorrhage, due to the rupture of an aneurysm, has been sometimes the first indication of its presence. In larger aneurysms the chief symptoms are (1) the presence of a pulsating tumor, (2) the conditions due to the pressure of the tumor. Naturally these vary with the location of the aneurysm; for examples: Pressure against a bronchus or the trachea by an aneurysm on the arch of the aorta will cause dyspnea, cough, alterations in the quality of the voice: pressure against the esophagus will cause dysphagia (*difficult swallowing*); moderate pressure on a sensory nerve will cause pain and extreme pressure, anesthesia; pressure on a motor nerve, paralysis; that on a sympathetic nerve may induce inequality in the size of the pupils and unilateral sweating; pressure on a large vein, enlargement of the veins in the part from which the return flow is interfered with, edema, and possibly cyanosis.

The presence of a large aneurysm is dangerous to life, death may occur from hemorrhage caused by the rupture of the aneurysm, exhaustion, asphyxia, or other pressure effects, or embolism.

The hemorrhage following the rupture of an aneurysm may possibly be checked by the formation of clots and the subsequent occlusion of the opening by the growth of fibrous tissue, but rupture of an aortic aneurysm is very likely to result in death which, as a rule, is almost in

stantaneous. The escaping blood may remain in the interior of the body or, if the aneurysm ruptures into the esophagus or air passages, the blood may reach the exterior.

Treatment.—The objects of the special treatment are to reduce the force of the blood flow as much as possible and to clot the blood in the sac. The first object is attained by (1) keeping the patient at absolute rest, both mentally and physically, until the blood is clotted; (2) limiting the diet to the amount required for basic metabolism; (3) restricting fluids to the limit of the patient's endurance. The means most commonly used to cause coagulation of the blood in the sac are: (1) introducing a sterile needle into the sac and, with it, scraping the walls of the latter; (2) introducing a fine silver wire into the aneurysm and sending an electric current along the wire; (3) injections of gelatine and calcium lactate are sometimes made. The antisyphilitic treatment is generally used.

After the blood in the sac is clotted and the heart is compensated (this is described with diseases of the heart) a slight amount of exercise is generally allowed and the use of liquids and food is not quite so strictly limited, but, otherwise, the precautions just mentioned must be maintained, for any considerable increase in the force of the blood pressure is likely to cause either hemorrhage or embolism.

Cerebral Hemorrhage

(*Cerebral Apoplexy*)

Etiology.—The causes of cerebral hemorrhage are generally divided into three groups, viz., (1) causes operating in the new-born, the most common of which is the

use of forceps during delivery, it generally consists in the rupture of blood-vessels in the meninges; (2) trauma; (3) pathological causes.

Cerebral hemorrhage from pathological causes occurs most frequently after 40 years of age, but no age is exempt. It is more common in men than women. **The usual pathological cause** in youth is a degenerated condition of the arteries such as may be produced by some of the infectious diseases, and, in adults, a premature arteriosclerosis. Of the conditions inducing premature arteriosclerosis chronic nephritis is especially likely to cause apoplexy because of the cardiac hypertrophy and increased blood pressure associated with the nephritis. When such conditions exist an apoplectic seizure may occur without any apparent exciting cause, sometimes even during sleep, but it more commonly follows something that induces an increased rise of blood pressure, such as excitement, emotional crisis, unusual muscular excitement, etc. In children with a predisposing condition of the cerebral arteries paroxysms of whooping cough may act as an exciting factor.

In children the hemorrhage usually occurs in the cortex. **The results** will depend upon the area in which the hemorrhage occurs and the degree to which the clot that forms following the hemorrhage, by its pressure, injures the nerve cells. The most common location is around the motor areas and paresis (*partial paralysis*) of some part of the body is a common consequence. If the association areas are involved the child may be mentally deficient or imbecile. However, if the clot is disintegrated before the nerve-cells are destroyed, recovery may occur.

In adults hemorrhage occurs most commonly in what is known as the internal capsule, which is external

to the third ventricle and consists chiefly of motor fibers passing from the motor areas of the cortex to the spinal cord. The hemorrhage may be sufficiently profuse to cause death in a short time, but, more commonly, it is from only moderately large or small vessels. However when the hemorrhage occurs in the internal capsule the subsequent clot, even though small, presses on a large number of fibers, because they are collected in a very compact bundle, and therefore hemiplegia (*paralysis of one side of the body*) is likely to result. The clot gradually shrinks and is finally disintegrated and absorbed, if this occurs before the pressure of the clot interferes with the circulation in the capsule sufficiently to destroy the fibers, the paralysis induced by its presence will disappear but if the nerve tissue is destroyed it will not recuperate, but will be replaced by scar tissue or possibly by cysts and, in such case, the paralysis will be permanent. Sometimes part of the fibers in the capsule are destroyed while others recuperate and therefore it is not uncommon for the paralysis of one limb to disappear, but not that of the other. The paralysis is always on the opposite side of the body from the hemorrhage, because of the crossing of the fibers in the medulla oblongata. Following the hemorrhage, spasmodic muscular twitching sometimes occurs due to irritation of the uninjured motor cells. If the hemorrhage is profuse some of the blood is likely to pass into the association areas and, if clots form there, some degree of mental deficiency is likely to result. When the hemorrhage occurs on the right side in left-handed people there is likely to be what is known as motor aphasia or aphasia of Broca in which the individual knows what he wants to say but cannot utter the words because of loss of memory of how to do so, or of loss of memory of the words to use, as in the case of paralysis the aphasia

(*loss of memory*) may be transient or permanent. This type of aphasia will not be present in left-handed people when the hemorrhage is on the right side because the so-called speech center only becomes fully developed on the side on which that controlling the arm is not as developed.

Symptoms.—An apoplectic seizure may occur without warning or it may be preceded for a varying length of time by prodromal symptoms occasioned by the cerebral congestion; common ones are: vertigo, headache, tinnitus, sensations of numbness and tingling in the parts that later become paralyzed, insomnia, restlessness, vomiting. Following the hemorrhage, coma usually develops, either suddenly or by degrees, occasionally, however, consciousness is not lost; the temperature, at first, may be subnormal from shock, but later it rises, quite markedly in some cases; the breathing may be stertorous and, especially after a large hemorrhage, it may be Cheyne-Stokes; the pulse becomes slow and full, but, except after a profuse hemorrhage, it is generally regular; the face may be either pale or congested; the extremities are cold and the muscles relaxed, but at times there is muscular twitching and sometimes convulsions, due to irritation of the motor centers; the eyes may be rotated toward the side of the hemorrhage; the pupils are likely to be irregularly dilated and do not react to light; sometimes urination and defecation are involuntary, but retention is common.

Results.—Death may occur within 48 hours or the patient may survive. In the latter case recovery from the immediate attack may occur in a few hours or not for several days, but as previously stated the degree of recovery from the effects of the hemorrhage will depend upon the amount of injury done to the brain tissue and it may

be months before the possible degree of recovery is attained.

Prophylaxis and treatment.—Prophylactic care is necessary for those who have arteriosclerosis or other predisposing conditions. Such prophylaxis consists in avoiding excitement and emotional strain; in not overeating, especially of rich protein foods; the avoidance of alcoholic drinks, and the prevention of constipation. The treatment for an attack consists in putting the patient to bed with the head slightly elevated and applying ice-caps to the head. If the mucus in the throat interferes with breathing the head must be kept turned on one side and, if necessary, as much as possible should be removed with pledgets. Croton oil, 1 to 3 drops, is usually prescribed and should be mixed with a little oil or glycerine and dropped on the back of the tongue. When the blood pressure is very high venesection is sometimes performed.

After even the slightest attack rest in bed for about 3 weeks is essential. After the acute symptoms have subsided massage and electric treatments are prescribed to maintain the tone of the muscles and prevent contractions until the nerve tissue is healed.

Next Here

Diseases of the Heart

Acute Endocarditis

By endocarditis is meant inflammation of the endocardium, *i. e.*, the membrane lining the heart.

Types.—The inflammatory process may be either acute or chronic and there are two types of the acute form, one of which is variously known as simple and benign and the other as ulcerative, septic and malignant.

So-called simple endocarditis is not as harmless as its name implies for, though it does not, like the malignant form, frequently have a fatal termination, even mild attacks are likely to injure at least one of the heart's valves and thereby induce a chronic valvulár disease, a common cause of ill health and sometimes death.

Etiology.—In post-mortem examinations on those who die of malignant endocarditis bacteria are always found in the heart lesions, but this is not always the case when death occurs during a simple endocarditis and thus it is thought that the characteristic injury of the endocardium occurring during a benign endocarditis may be due to bacterial toxins produced in other parts of the body and not necessarily, as in the case of malignant endocarditis from invasion of the endocardium by bacteria. Simple endocarditis is quite a common complication of many of the infectious diseases, but acute rheumatic fever is the most common causative factor and chorea and tonsillitis are very commonly associated with it. The toxins of the organism causing rheumatic fever seem to have a strong affinity for the endocardium, for endocarditis has not infrequently resulted from attacks of rheumatism that were so slight that the only apparent symptoms were attributed to growing pains.

The ulcerative form of the disease may be due to a severe infection of the rheumatic organism, but the streptococcus, staphylococcus, gonococcus, and pneumococcus are the most frequent causes and the condition often occurs as a part of a general septicemia.

Pathology.—**In benign endocarditis** the inflammatory process is usually confined to the flaps of one of the valves and, except in very mild affections, the endocardium and underlying myocardium directly around the valve. When the endocarditis starts before birth it is usually

one of the valves of the right side of the heart, generally the tricuspid, that is affected, but after birth it is most commonly the mitral valve and, next to this, the aortic. The flaps of the valves, it will be recalled, consist mainly of an exceedingly thin, delicate base of fibrous tissue covered on both sides with endocardium. The infection of the flaps, by either bacteria or their toxins, results in their congestion and the roughing of their surfaces. The congestion is followed by the exudation of fibrin and lymph from the engorged vessels. The exudates form in minute nodules—termed *thrombi* and *vegetations*—chiefly along the free margin of the flaps. Their presence inhibits firm closure of the flaps and allows the blood to regurgitate through the affected valve. Expecially when the inflammatory process is severe, some of the thrombi may become detached from their hold and be swept into the blood stream, *i. e.*, they are emboli; if the emboli do not plug an important vessel and do not contain bacteria, they may do no harm, but otherwise they are a source of danger to life, as described under Embolism. As a rule, in benign inflammations resolution occurs promptly, but even in mild cases scars tend to form on the site of the inflammatory process and thereby induce one or other of the chronic valvular defects described later.

In malignant endocarditis the inflammation is likely to become diffuse, practically the whole heart being sometimes involved, the thrombi are more numerous and larger and contain bacteria. The tissue underneath the thrombi tends to ulcerate and necrose and thus they are more frequently swept into the circulation. Also the condition is associated with toxemia. If the patient recovers, which is rarely the case, the amount of scar tissue is more profuse and the consequent valvular defects more pronounced than following simple endocarditis.

Symptoms. Simple endocarditis.—In mild affections there may be no subjective symptoms and the condition is only discovered on auscultation, the sign being a murmur over the affected valve. In more severe infections, in addition to the heart murmur, there is likely to be slight fever or, if the endocarditis occurs while the temperature is still high from the primary disease, the fever is likely to be increased; the pulse becomes somewhat accelerated and it may be irregular; there may be dyspnea and cyanosis, especially if the patient is restless; there may be discomfort or pain in the heart region, the pain may be slight or intense and stabbing.

In malignant endocarditis the symptoms vary, they are due to both the heart condition and the toxemia. Those due to the former cause are similar to those of a severe benign endocarditis. The toxemia may induce either (1) symptoms similar to those of septicemia, viz., chills, irregular temperature, anemia, emaciation, and sometimes delirium; (2) a typhoidal condition, described under Typhoid; (3) symptoms similar to those of meningitis. Also, especially when the endocarditis is due to pyogenic bacteria, there will be a high leucocytosis and the bacteria are likely to be found in the blood. After 2 or 3 days symptoms due to embolism are likely to occur. These vary according to part affected as described under Embolism.

Prophylaxis and treatment.—The most important prophylactic measures are: (1) to keep the teeth and mouth is good condition, this includes the removal of abnormal tonsils and adenoids; (2) to keep a patient with acute rheumatic fever very quiet and well nourished. It is to be remembered that so-called growing pains may be a mild attack of acute rheumatic fever.

Rest, mental and physical, and a sufficient amount

of easily digested nutritious food to supply the required number of calories for the body's demands are also of primary importance in the prevention and treatment of endocarditis. To realize the importance of these requirements, both as prophylactic and curative measures, it should be recalled that: (1) To combat infection a tissue must be well nourished; (2) it is during the diastasis and diastole of the heart's cycle that the coronary vessels (which supply the heart tissue with blood) become filled, while the blood tends to be expelled during systole; thus it is during the diastasis and diastole that the heart gets most of its nourishment and oxygen and it is these phases of the cycle that are first shortened when the rate is increased, the time of systole only being decreased when the rate is accelerated to above 130 beats per minute. Even in health there will be an increase of about 10 beats per minute when an individual assumes an upright position and excitement will induce an even greater increase; (3) if the heart hypertrophies, as described under Valvular Diseases, the ill effects of the damage done the valves and the myocardium by the inflammation will be minimized and the chances are that, at least during youth, the individual will not suffer from the disorder, but in order to hypertrophy the heart muscle must be well nourished and given as much rest as possible; (4) increase in the rate and force of the heart's action is likely to dislodge thrombi and cause embolism.

Therefore, unless other conditions, as dyspnea, make it impossible, the patient must be kept in a recumbent position and excitement and anything that tends to promote restlessness prevented. These precautions must be observed until the heart becomes fully prepared to do the extra work that it will have to perform, which may

take several months. During the acute stage of endocarditis an ice-cap is kept over the heart, because cold tends to lessen the heart's tumultuous action. Various tonics are prescribed when necessary and, especially in malignant endocarditis, vaccines are sometimes used, autogenous vaccines being usually prepared for the purpose if the causative organisms can be found in the blood. Another very important item in the treatment of such patients is the prevention of constipation, which favors flatulence, for if the intestines are distended they will cause pressure against the heart and may thus interfere with its action.

Chronic Endocarditis

Chronic endocarditis is a mild persistent inflammation of the endocardium that is, as a rule, localized to one or more of the valves. It may follow an acute attack or develop insidiously as the result of such conditions as gout, chronic nephritis, chronic lead poisoning, syphilis, and alcoholism.

The symptoms induced and the **treatment** required will depend upon the nature of the valvular lesion. The various valvular lesions are described under Chronic Valvular Diseases.

Cardiac Compensation and Cardiac Failure

Cardiac compensation consists in what is known as hypertrophy of a part, or the whole, of the heart muscle and sometimes of a slight dilatation of the cavity from which flow of blood is interfered with. Increased work tends to increase the size and strength of any muscle provided the muscle is supplied with an adequate supply

of nourishment; therefore, when any part of the heart is forced to do extra work, its muscle tissue, if conditions are favorable, becomes thicker and the heart is enlarged. This is what is known as hypertrophy. The dilatation of a cavity from which the flow of blood is interfered with allows it to hold the extra blood which the obstruction obliges it to contain.

Though the conditons constituting a compensated heart enable it to overcome the effects of a cardiac lesion, a compensated heart is not a normal one and the affected chamber is likely to be constantly dilated to almost the full capacity that can be attained without disaster and thus it may not be able to meet the calls for dilatation that increased muscular exercise and excitement always make upon the heart. Moreover, as the heart may be working to the limit of its capacity to overcome the effects of the lesions and maintain the circulation under ordinary conditions, it must almost inevitably, in the course of time, succumb to strain, especially if extra demands are made upon it, as by illness and excessive muscular exercise and excitement. This is especially likely to be the case as age advances and the arteries lose their elasticity and thus offer increased resistance to the heart's action. When the strain is greater than the heart can withstand the tone of the myocardium is lost, its fibers relax, and then the chambers dilate to an abnormal degree, bringing about the effects described later under Mitral and Tricuspid Insufficiency. This condition is variously known as *cardiac* (*heart*) *failure*, *broken compensation*, and *decompensation*. Sudden death is a common outcome of cardiac failure, but if the dilatation of the chambers is not extreme, death may be averted and the heart again resume a condition ot compensation.

Chronic Valvular Diseases

Valvular diseases are generally classed under two headings, viz., (1) valvular insufficiency or valvular incompetence, (2) stenosis.

By insufficiency or incompetence is meant that the cusps or flaps do not come together properly when the valve closes and this allows the blood to regurgitate.

Insufficiency of the aortic valve (*i. e., the semilunar valve between the left ventricle and the aorta*) is generally the result of either (1) contraction of the cusps of the valves as the result of injuries caused by endocarditis; (2) sclerosis (*hardening*) of the cusps, this may be due to chronic endocarditis, syphilis, or old age; (3) dilatation of the orifice of the valve, which is usually the result of dilatation of the left ventricle or of the presence of an aneurysm on the arch of the aorta.

As the result of the imperfect closure of the aortic valve some of the blood regurgitates from the aorta back into the left ventricle at the completion of each ventricular systole and thus during diastole two streams of blood enter the ventricle, one from the auricle as usual and one from the aorta. Thus the ventricle must dilate somewhat to hold the extra blood and it must put forth extra force to overcome the counter current from the aorta. This causes it and, though to a lesser extent, the whole heart to hypertrophy. Because of the extra force that the heart puts forth the pulsation in the larger arteries is extreme and it may sometimes be perceived even in the arterioles and capillaries, also the pulse may assume the characteristics known as *Corrigan's pulse* or *water-hammer pulse*, in which the pulse wave rises suddenly to an unusual degree of fullness and then collapses abruptly as some of the blood regurgitates from the aorta into the

ventricle. If the heart becomes properly compensated the patient may not know that he has anything the matter with his heart, or he may possibly be conscious of slight dyspnea on exertion, but so long as compensation is adequate he experiences little trouble, eventually, however, as old age advances and the arteries become sclerotic, or if the heart muscle becomes weakened by illness, the left ventricle may dilate, so much so that the mitral valve, though it may be in a perfectly normal condition, will not completely close the orifice between the ventricle and auricle and then what is known as *relative mitral insufficiency* ensues.

Mitral insufficiency is due to defective closure of the mitral valve, which is between the left auricle and left ventricle. This **may be the result of** (1) contraction or curling of the cusps due to the scar tissue formed as the result of acute endocarditis, (2) sclerosis of the cusps due to chronic endocarditis, or (3) dilatation of the ventricle as described in the preceding paragraph. When any of these conditions exist the cusps do not come together properly when the valve closes and some of the blood regurgitates into the auricle. This backward flow of blood interferes with the stream entering the auricles from the pulmonary veins and consequently the blood becomes dammed back and the vessels in the lungs become congested. Consequently, the pulmonary circulation is interfered with and the blood does not become properly aërated. However, under proper treatment the auricle will dilate somewhat and the heart muscle hypertrophy and, as long as this state of compensation is adequate, the flow of blood from the veins will not be seriously interfered with and the bad effects just described will be averted. The pulse however is likely to be weaker than normal because somewhat less blood is

forced into the aorta (*on account of that regurgitating*): murmurs and other abnormal sounds are heard on auscultation, and the individual experiences dyspnea on exertion, but these may be the only signs that anything is wrong. If however anything occurs that makes it necessary for the heart to do extra work or to weaken the heart muscle, the effects of interference with the pulmonary circulation will be marked and there may then be cyanosis, dyspnea, cough, bronchitis, effusion of fluid into the pleural cavities, and the pulse will become weak and irregular. Moreover, if the condition of the heart muscle is not improved and the compensation restored, the interference with the pulmonary circulation will soon cause dilatation of the right side of the heart and relative tricuspid insufficiency then ensues.

Tricuspid insufficiency is almost always **due** to interference with the pulmonary circulation; it may however result from endocarditis affecting the right side of the heart but, as previously stated, this rarely occurs except when the infection takes place before birth. **As the result of tricuspid insufficiency,** when the heart is not properly compensated, there is a backward flow of blood from the right ventricle and this interferes with the flow of blood into the auricle from the venæ cavæ and consequently causes congestion in the veins in almost all parts of the body. **Common symptoms are:** Dyspnea, cyanosis; cardiac palpitation; pulsation in superficial veins, especially those of the neck, edema, which begins in the legs, where the venous circulation is at the greatest disadvantage; also there may be edema of the lungs, hydrothorax,[1] hydropericardium,[1] and ascites.[1] The congestion of the digestive organs interferes with digestion and thus digestive disturbances are common: there

[1] Described on page 551.

may be hemoptysis; the urine is scanty and highly colored and may contain albumin and casts.

By stenosis is meant narrowing or constriction. The cusps of the affected valve (which is usually the mitral) are thickened and glued together by exudated material which frequently contains deposits of calcareous (*lime-like*) matter and the chordæ tendinæ are usually contracted, thick and stiff. Because of these conditions, when the valve opens, its cusps project outward and lessen the size of the orifice through which the blood flows into the ventricle. The interference with the passage of blood into the ventricle induces conditions similar to those produced by mitral insufficiency. Mitral stenosis is usually the result of endocarditis, but it may also develop gradually in connection with arteriosclerosis, especially when this condition occurs prematurely.

Occasionally **stenosis of the aortic valve** occurs. It is almost always associated with premature arteriosclerosis. The results are very similar to those of insufficiency of the valve.

Prophylaxis and treatment.—Individuals with any form of chronic heart disease should live a quiet life. They should not indulge in strenuous exercise nor labor and should avoid excitement, but they should, when well, take a moderate amount of exercise. Anything that causes a sudden change in the distribution of the blood, as getting up quickly and getting quickly into a cold bath, should be avoided and also conditions that favor "taking cold," and constipation. Only enough food to supply the body's requirements and maintain normal weight should be eaten, because if a person becomes fat the heart has to do extra work to force the blood through the increased tissue. Protein foods especially should be restricted, because disease of the

kidneys is very likely to complicate chronic heart disturbances and thus these organs must be spared the extra work thrown upon them when they have to eliminate excess protein. The foods used must be those which the individual can digest easily. The diet necessary when there are kidney complications and edema is described under Nephritis. When, from any cause, the individual is indisposed he should remain in bed. Shower baths, Nauheim, and similar baths are frequently prescribed for they tend to improve the circulation. Massage is frequently used for the same reason. If a break in compensation occurs rest in bed until physical signs show that compensation has been restored is imperative. This may require several months. During this time special care is likely to be necessary to prevent bed-sores. A sitting position is usually required on account of dyspnea and every means must be taken to provide a comfortable support.

Pericarditis

By pericarditis is meant inflammation of the pericardium.

The pericardium, it will be recalled, **is** a double bag the inner sac of which is composed of serous membrane and attached to the heart, while the outer one consists mainly of thin, but strong, fibrous tissue lined with serous membrane that, at the upper border of the heart is continuous with that covering it. The fibers of the pericardium blend into those of the walls of the large blood-vessels near their connection with the heart and, at its lower end, the pericardium is attached to the diaphragm and, in front, bands of fibrous tissue connect it with the sternum. **The purposes of the pericardium are:**

(1) To, by its attachments, help to hold the heart in place; (2) to secrete a small amount of fluid to act as a lubricant and thus prevent movements of the heart causing friction between the pericardial surfaces (*under normal conditions the absorption of the fluid by the pericardial lymph-vessels about keeps pace with secretion*); (3) to prevent undue dilatation of the heart by the blood entering its cavities.

Etiology.—The most frequent cause of pericarditis is rheumatic fever, but it also occurs as the result of other infections, especially scarlet fever, pneumonia, and tuberculosis; it may also result from the extension of inflammation from adjacent organs, and of certain chronic diseases, especially nephritis.

Pathology.—In the first stage of pericarditis there is intense hyperemia (congestion), this is followed by exudation and, according to the nature of the exudation, the pericarditis is classified as (1) fibrous, dry, or plastic, (2) serofibrinous, (3) purulent or malignant. In the fibrous variety there is an exudation of fibrin over the pericardial surfaces which gives them a shaggy appearance. If this condition is extensive the fibrous matter may form permanent adhesions between the two layers of pericardium and also adhesions between the outer surface of the pericardium and the adjacent organs. The adhesions interfere with the heart's action. However, if the interference is not extreme, the enforced work will cause hypertrophy of the cardiac muscle and the heart will be compensated for the extra strength it has to put forth but, just as when the compensation is due to endocarditis, it may cease to be efficient if the heart is called upon to do extra work and then conditions similar to those induced by breaks in compensation due to valvular lesions ensue. In the serofibrinous variety

the exudate consists of a serous fluid containing a varying amount of fibrin. The amount of fluid varies in different cases from about an ounce to a quart or more. As recovery occurs the fluid is absorbed, in mild attacks completely so, but when there is much fibrin in the exudate, adhesions are likely to form here and there between the two pericardial layers. In the purulent type the fluid contains pus and the condition is very likely to be fatal. Purulent endocarditis may be purulent from the onset or it may develop in the course of a serofibrinous pericarditis.

Symptoms.—Diagnosis is made chiefly by the sounds heard on auscultation for the other symptoms are not very definite and are likely to be masked by those of the primary disease. The more common characteristic symptoms are: Discomfort and pain referred to the heart region; rapid, irregular pulse; cardiac palpitation; dyspnea; fever or, when the temperature is already high, a further rise, but, except in the purulent variety of pericarditis, fever due to the pericarditis is not very marked; the face may be pale or cyanosed.

Prophylaxis and treatment.—The prophylactic measures to prevent pericarditis complicating infectious diseases and the care required during an attack are the same as for endocarditis and, if permanent lesions occur, the measures necessary to prevent breaks in compensation are the same as those required when the compensation is the result of valvular defects.

Myocarditis

By myocarditis is meant inflammation of the myocardium, *i. e.*, the main substance of the heart. The term however is also used to include degenerative changes

that are not truly inflammatory, which are sometimes brought about by bacterial toxins and by diseases that markedly interfere with the heart's nutrition for an extended period.

Etiology.—There is usually a varying degree of myocarditis associated with endocarditis and pericarditis, but a general inflammatory myocarditis is usually due to infection by pyogenic bacteria which are brought to the heart by the blood, and the degenerative form to the toxins of diphtheria and scarlet fever and to syphilis.

Symptoms.—A weak irregular pulse, which may be either unusually rapid or slow (*a pulse suddenly becoming slow in the course of an infectious disease, especially diphtheria, when other conditions are not in keeping, is to be regarded as suspicious of myocardial complication*); there are also likely to be cardiac palpitation; dyspnea, especially on exertion; drowsiness after meals; pallor on exertion; coldness of the feet; and in grave cases cyanosis of the lips and finger tips. In malignant endocarditis, *i. e.*, that due to pyogenic bacteria, there will also be the symptoms of sepsis described under Septic Diseases.

Angina Pectoris

Angina pectoris is a syndrome that may occur in connection with a number of abnormal conditions of the heart and aorta and, in some cases, post mortem examinations of fatal cases have failed to disclose any reason for the angina, but it is believed that death is usually due to excessive stimulation of the vagus nerve.

Symptoms.—The most characteristic symptoms are:—Fear of impending death; pain of varying degrees of intensity, which usually radiates from the region of the heart over the left side of the chest and neck and down

the left arm. When an attack begins the individual usually stops what he is doing and remains perfectly rigid, with his arms pressed tightly against his chest or side, afraid to breathe lest he increase the pain. The face is usually pale, though it may be congested. The pulse varies, it may remain normal or it may become unusually slow (*due to vagus stimulation*). There is often a sense of suffocation and, in severe attacks, there may be dyspnea and the whole body may be bathed in sweat. There may be persistent hiccup.

As a rule attacks are of short **duration** sometimes lasting only a few seconds or minutes. Sudden death is a common **outcome,** but some persons have repeated attacks at intervals for years. In those predisposed, attacks are often caused by unusual muscular activity, excitement, flatulence, and other gastro-intestinal disturbances.

Prophylaxis and treatment.—The essential prophylactic measures are the same as those required in valvular diseases. During an attack some of the following drugs are commonly used: Nitrite of amyl (*this is given by inhalation*), nitroglycerine, adrenaline, atropine, and, if pain is severe, morphine.

End

Jan. 7, 1929

Diseases of the Respiratory Tract

Adenoids

The term adenoids is applied to hypertrophy of the normal lymphoid tissue which, in childhood, is especially abundant around the root of the tongue and in the naso-pharynx.

Etiology.—Adenoids are particularly common in children who live in unhygienic surroundings, in those

who are poorly nourished, and in those whose parents have chronic diseases. Frequent colds and tonsillitis further the hypertrophy and some physicians believe the motions of sucking (*which cause movement of the tissues at the back of the throat*) do so when they are prolonged, as when a child is allowed to suck pacifiers or its fingers.

Symptoms and Results.—The obstruction interferes with the passage of air from the nose and thus the child keeps its mouth open most of the time, and an infant does not nurse properly, but has to stop frequently to breath through its mouth. Sleep is disturbed and the child snores. There is a constant inflow of nerve-impulses to the nerve centers and, even when the child is too young to interpret the result as discomfort, he is likely to be irritable, also, the nervous disturbance may result in digestive disorders and defective metabolism. The forced breathing tends to alter the shape of the chest. The contour of the face is likely to be changed, the base of the nose becoming widened and prominent (*because of the pressure of the adenoids behind it*), the nostrils narrowed, and the roof of the mouth unnaturally arched and narrow, which makes the upper jaw project beyond the lower. The adenoids are likely to block the pharyngeal openings of the Eustachian tubes and this may cause disturbance of hearing; moreover, the irritation of the pharynx, induced by the presence of the adenoids, causes a passive congestion which predisposes the child to colds and, consequently, to the presence of infective matter in the nose and throat, which favors infection of the Eustachian tubes and of the middle ear, mastoid sinuses, and the sinuses in the facial bones. The mouth breathing is also a source of danger, because the mouth is not, like the nose, furnished with ciliated epithelium to in-

hibit the entrance of bacteria, dust, etc., to the respiratory organs.

Treatment.—If the adenoids are large enough to obstruct breathing they are removed. After operation corrective breathing exercises are generally prescribed for those whose throat and chest have been rendered abnormal by the forced breathing.

Acute Tonsillitis

Tonsillitis implies inflammation of the tonsils. It is **most common** in youth, but it may occur at all ages.

Cau **Etiology.**—Predisposing causes are exposure to cold and wet, and ill health from any cause, also it is frequently associated with other bacterial diseases, especially acute rheumatic fever, endocarditis, chorea, and septicemia. The active cause is bacterial infection and a number of organisms may be responsible.

There are two **types** of acute tonsillitis, viz., follicular tonsillitis and phlegmonous tonsillitis or quinsy. **In the follicular type** the inflammation is relatively superficial and the pus is discharged through the follicles, *i. e.*, the superficial openings of the lacunæ of the tonsils. Therefore many of these may become filled with pus and degenerated epithelium. This produces small yellow spots on the surface of the red and swollen tonsils. **In the phlegmonous type** the suppurative process is more deeply seated and the pus is not discharged at first, consequently, after 3 or 4 days, an abscess forms in the interior of the tonsil and the latter becomes intensely swollen so much so that, when both tonsils are affected, the throat may be practically closed and breathing seriously interfered with. After the sixth day, if the

abscess is not incised, it ruptures and the pus is discharged into the mouth.

Symptoms.—The chief symptoms, in addition to the throat condition, are: Chilliness followed by fever (103° F. or over); rapid pulse; malaise; headache; pain in the joints, back, and throat; the latter is especially severe in quinsy and, in the latter type of the disease, there may be difficulty in breathing and swallowing may give rise to excruciating pain.

Treatment.—Antiseptic gargles and sprays are used, the tonsils are sometimes painted with iodine or silver nitrate or other astringent antiseptic; external applications, either hot or cold, are sometimes prescribed and also drugs such as aspirin. In quinsy, after the third or fourth day, the abscess is usually incised because this relieves the pain and there is less danger of the pus getting into the air-passages when this is done than when the abscess is allowed to rupture spontaneously. If pus enters the lungs, pneumonia is likely to follow.

Chronic Tonsillitis

(*Hypertrophy of the Tonsils*)

Etiology.—Chronic enlargement or hypertrophy of the tonsils sometimes follows repeated acute attacks of tonsillitis, but it also occurs, especially in youth, without any obvious cause and as the result of some of the acute infectious diseases. The condition is sometimes associated with adenoids and with a more or less general hypertrophy of lymph-nodes in various parts of the body.

Pathology.—The tonsils are more or less enlarged and the enlargement is often due to connective tissue proliferation; in some cases the follicles of the tonsils are dilated and filled with debris of epithelial cells. **Chronic**

tonsillitis favors acute infections of the tonsils and adjacent parts and also the passage of germs into the general circulation, for, it is believed, the normal tonsils, like true lymph nodes, serve as places where bacteria are destroyed by phagocytosis and, when the tonsils are in abnormal condition, the germs absorbed from the mouth may not be destroyed, but pass into the connecting lymph-vessels and, if they escape through the lymph-nodes, they enter the blood.

The symptoms are similar to those of adenoids.

The treatment consists in the use of gargles and local applications and, if these are not successful, excision of the tonsils.

Acute Bronchitis

Bronchitis is an inflammatory condition of the membrane lining the bronchi, it may be either acute or chronic.

Etiology.—The *Micrococcus catarrhalis*, a common cause of colds, is one of the most frequent active causes, but a number of other organisms may be responsible. The bronchitis frequently results from the extension of a laryngitis (*inflammation of the larynx*) or pharyngitis (*inflammation of the pharynx*). Predisposing causes are ill health and exposure to cold and wet.

Symptoms.—The onset is likely to be marked by chilliness, irritation of the throat and bronchi, and consequent coughing. At first the cough is dry and associated with more or less pain, but later secretion of mucus is stimulated and the pain is lessened; the expectoration gradually becomes profuse and mucopurulent in character. Breathing is likely to be somewhat difficult and, in severe inflammations, of a noisy, whistling char-

acter. If the inflammation is excessive there may be dyspnea and cyanosis. There may be slight fever, but the temperature rarely becomes very high. The skin is likely to be moist. Headache and malaise are common.

Uncomplicated bronchitis is rarely fatal, but especially in the young and aged, or those debilitated by chronic diseases, the inflammation is likely to extend to the bronchioles and thus induce bronchopneumonia which, under such circumstances, is a very common cause of death.

Treatment.—This consists chiefly in rest in bed and measures to improve the general health. Expectorants are generally prescribed and also steam inhalations and drugs to allay coughing.

Chronic Bronchitis

Chronic bronchitis may result from (1) repeated attacks of the acute type, (2) continuous irritation of the bronchi from any cause, (3) interference with the circulation in the bronchial vessels, this is common in chronic heart and kidney diseases and in old age.

Pathology and Symptoms.—The membrane lining the bronchi may be either hypertrophied or atrophied. There is likely to be excessive secretion of mucus and therefore profuse expectoration, though sometimes this is not the case. The nature of the sputum varies, sometimes it is very fetid. Cough is troublesome especially when the sputum is not easily expectorated. The condition is usually worse in cold weather and whenever the individual's health is depleted. At such times there may be slight fever and the other symptoms present in acute attacks.

The treatment consists in measures to improve the

general health and autogenous vaccines are sometimes prescribed.

Bronchial Asthma

Asthma is a condition characterized by recurrent attacks of paroxysmal dyspnea due to spasm of the bronchioles, it is associated with congestion and swelling of the bronchial mucosa and the excessive secretion of tenacious mucus.

Etiology.—Asthma is an anaphylactic reaction that develops as the result of exposure to a protein to which the individual has become sensitized. **The causative protein** varies in different individuals, it may be: (1) A food protein, it is most commonly one of those of the following foods that is responsible: eggs, milk, beef, chicken, lobster, fish, wheat, corn, rye, rice, potato, occasionally fruit, especially strawberries; (2) a protein produced as the result of intestinal putrefaction; (3) a bacterial protein, this may be produced in the course of a focal infection; (4) a protein in the dust of animal emanations; (5) a protein in the pollen of plants. Asthma due to the cause last mentioned is known as *hay asthma* or *pollen asthma;* it usually occurs in connection with hay fever. Asthma also sometimes occurs in connection with heart diseases (*cardiac asthma*) and nephritis (*renal asthma*), it is believed that the asthma in these diseases is due to some foreign protein formed in the body.

A predisposition to sensitization by proteins seems to be inherited, but the child is not necessarily sensitive to the same protein as the parent. The condition usually manifests itself in youth and a primary attack rarely occurs after the fiftieth year.

The causative protein may produce attacks by (1)

stimulating the vagus nerve (*it will be recalled that stimulation of the vagus increases the contraction of the plain muscle tissue of the bronchi and that stimulation of the sympathetic lessens contraction*), (2) by direct action upon the tissue of the bronchi. It may reach the bronchi by inhalation or be carried to them by the blood.

Symptoms.—There may be premonitory symptoms such as flatulence, sneezing, chilliness, mental depression, but even in such case, the onset of an attack is sudden and it generally occurs at night. An attack is associated with dyspnea; sensations of oppression in the chest, and of suffocation; the breathing is labored and slow, because each expiration is prolonged and forced, this gives rise to a peculiar noisy, wheezing sound. There is cyanosis and the patient's want of air is so great that he generally tries to get to a window as soon as an attack begins. He cannot lie down, but usually sits with his arms resting on a table or grasping some support in a manner to fix the shoulder girdles, for this favors the free movement of the muscles that are forced into action when breathing is interfered with. The facial expression is anxious, the extremities cold, and there is free perspiration. Paroxysms of coughing and expectoration occur and may at any time give relief, though sometimes only temporarily. The expectorated sputum contains small masses of mucus that are casts of the bronchioles from which they are expelled and it also contains eosinophil leucocytes from the blood, and these cells are found in increased numbers in the blood during, and for some time after, an attack.

An attack may last but a few minutes or for several hours. Death rarely occurs from paroxysms.

Prophylaxis.—Important prophylactic measures are: The treatment of any possible predisposing cause such as

focal infections, and gastro-intestinal disturbances; care in the diet, which must be restricted to the individual's nutritive requirements, foods the use of which seem to be followed by attacks must be avoided; the prevention of constipation. Change of air is often of help, but the climate that is most advantageous varies with different individuals. Calcium chlorid is sometimes prescribed for it is thought to have an antianaphylactic action. If the protein to which the patient is sensitive[1] is discovered a vaccine prepared from it is sometimes used.

Treatment During an Attack.—Fresh air is essential and the patient craves it, but care must be taken to prevent him taking cold, which is an easy matter as perspiration is profuse. One or more of the following drugs, atropine, stramonium, belladonna (*these give relief by depressing the vagus nerve-endings*), adrenaline, (*which stimulates the sympathetic nervous system*), amyl nitrate or potassium nitrate (*these depress the plain muscle tissue of the bronchi*), morphine is occasionally given for severe attacks. The stramonium and belladonna are usually given by inhalation, either by burning the leaves and having the patient inhale the fumes or he may smoke cigarettes prepared from the leaves. The potassium nitrate is also used as an ingredient of cigarettes. The amyl nitrate is given by inhalation, about 5 drops being put on a handkerchief or gauze pad and held in front of the nose and mouth.

[1] When there is any indication of the nature of the causative protein a sensitization test is made if this is possible. A common method of making such a test is to scarify a small area of skin and rub a preparation of the protein over the denuded area. If the patient is sensitive to the protein a localized eruption is likely to occur.

Pneumonia

Pneumonia signifies inflammation of the lungs. There are two main **types,** viz., lobar or croupous pneumonia and lobular or bronchial pneumonia. In the former the inflammatory process involves one or more whole lobes of a lung or, occasionally, of both lungs, while in lobular pneumonia it is scattered groups of alveoli (*air-sacs*) and bronchioles that are affected, but a whole lobe does not become consolidated as in the lobar type.

Lobar Pneumonia

Etiology.—The usual specific cause of lobar pneumonia is the *Diplococcus lanceolatus*, known also as the *Pneumococcus of Fränkel.*

Common predisposing causes are.—(1) Lowered vitality as the result of fatigue, alcoholism, disease, or other cause (fatal pneumonia occurring in the course of a chronic disease is known as *terminal pneumonia*); (2) congestion of the respiratory organs as the result of chilling of the body surface; (3) congestion as the result of interference with the pulmonary circulation, this is common in heart affections, in the aged, and in individuals who are obliged to lie for a long time in one position (when due to this cause it is known as *hypostatic pneumonia*); (4) irritation of the lungs from the inhalation of irritant gases (*inhalation pneumonia*); (5) the entrance of foreign bodies into the bronchi,. as sometimes occurs during anesthesia, or operations on the nose and throat (*aspiration pneumonia*); (6) wounds of the lungs or severe injury to the chest (*traumatic pneumonia*).

When one or more lobes in both lungs are invaded the condition is known as *double lobar pneumonia;* if, as one lobe resolves another becomes solid, the condition is

termed *migratory pneumonia;* if the consolidation is chiefly in the central part of a lobe or lobes, the condition is known as *central pneumonia.* There is less pain when the pneumonia is central because the pleura does not then become inflamed and the acute pain in pneumonia is due chiefly to associated pleurisy.

Lobar pneumonia may occur at all **ages,** but it is most common between the twelfth and thirty-fifth years and it is more common in males than females.

One attack increases an individual's susceptibility and thus recurrences are common. The disease is most prevalent in winter and early spring.

The pneumococcus is very frequently found in the mouth secretions of individuals who are in perfect health, but if they have not recently been in contact with a pneumonia patient or themselves recently recovered from the disease, the germs are of an atypical type and of low virulence. Persons who have recently recovered from pneumonia, however, and those who have been in contact with pneumonia patients are very likely to have virulent germs in their mouth secretions and such persons act as **carriers** and very probably are frequently responsible for the spread of the disease, even though they themselves are not harmed by the germs they harbor.

The germs are discharged in the mouth secretions and anything contaminated by these may transmit infection temporarily, but the pneumococcus soon dies outside the body.

Though it is most commonly the lungs in which the pneumococcus causes inflammation, it at times induces meningitis, peritonitis, endocarditis, and other inflammations. As a rule, such inflammations are secondary to pneumonia, but occasionally they occur independently of a lung infection.

The condition of the lungs in pneumonia varies at different stages of the disease and, depending upon the variations **the stages are known as:** (1) The stage of engorgement, (2) the stage of red hepatization, (3) the stage of gray hepatization; (4) resolution.

In the stage of engorgement the capillaries surrounding the alveoli in the affected area become intensely congested. As this condition increases, plasma, red corpuscles, and leucocytes pass from the congested vessels into the air-sacs and clots form, thus the alveoli of the affected area are rendered useless for respiration, since air cannot enter them. The affected portion of the lung is no longer light, spongy, and elastic, but firm, like liver, and intensely red, this constitutes the **stage of red hepatization**—the term hepatization being derived from the Greek *hepar*, which signifies liver. The phagocytes soon collect in great numbers in the inflamed area, and, by their presence and their effects on the exudate, they give a grayish mottled appearance to the part, this constitutes the **stage of gray hepatization.** The phagocytes endeavor to destroy the pneumococci and, in the process, many of them are themselves destroyed. When this happens a ferment secreted by these cells is liberated and it gradually causes the liquefaction of the clotted exudate in the alveoli. Some of this is absorbed by the blood and some of it is expectorated. The time during which this is happening is known as the **stage of resolution.**

The consolidation, even when only one lobe is affected, interferes with the pulmonary circulation and this is likely to cause **dilatation of the heart,** which is one of the most common causes of death in pneumonia. The dilatation may also be the result of the toxins on the heart muscle. Also, most of the symptoms, except those directly connected with breathing, are due to the **toxemia.**

Symptoms.—The onset is almost invariably sudden and usually begins with a severe pain in the side, a chill that is followed by a rise of temperature, and sensation of malaise. The temperature rises rapidly to about 104° to 106° F. and it remains high until the crisis. The pulse usually ranges between 100 and 120 and it is generally full and bounding, but in severe cases it may become weak and more frequent. The breathing is shallow and rapid, sometimes 60 to 70 per minute and it is associated with dilation of the nostrils at each inspiration and the patient gives a grunt with each expiration. Dyspnea becomes pronounced. The cheeks are flushed, the eyes bright, the lips may become cyanosed, if this occurs early or is extreme, it is a serious indication. Herpes is generally present, especially around the mouth. The patient usually lies on the affected side so as to give the normal lung free play. Cough is frequent and troublesome and causes pain. It is soon associated with expectoration. **The sputum,** during the first stage, consists of a frothy watery fluid mixed with mucus, in the second stage it becomes extremely tenacious and is usually blood-streaked, occasionally it contains so much blood and disintegrated exudate and cells that it has a dark reddish brown color, this is known as *prune-juice sputum.* When resolution begins the sputum ceases to be blood-streaked and it is likely to be more abundant and often mucopurulent, but the quantity gradually decreases. The pneumococci are in the sputum. Delirium is common, almost from the onset of the disease, and, in severe cases or when the patient is addicted to alcohol, it is likely to assume a maniacal character; in such case it is sometimes the cause of death, because of the strain that the excitement and restlessness impose upon the weakened, overworked heart. Occasionally the mental disturbance per-

sists for some time after the crisis. While the temperature is high the secretion of urine is diminished. Constipation is common until after convalescence and, partly because of this, there is a tendency to flatulence and consequent abdominal distention. Any appearance of this should be reported to the physician at once, because the distended bowel is likely to cause pressure against the heart and interference with its action. There is likely to be a marked leucocytosis—15,000 to 40,000. Sweating may occur at any time during the disease, but as a rule it does not do so until the crisis. When it occurs at other times symptoms of collapse are to be watched for. Sweating, increased rate of the pulse, and increased dyspnea, cyanosis, and delirium are **common indications that collapse is imminent.**

The crisis usually occurs on either the seventh, fifth, sixth, or ninth day, usually the seventh. Sweating is likely to be the first sign, then the temperature falls and it is likely to reach normal within twenty-four hours; occasionally, however, it falls by lysis, taking three or four days to reach normal. The other symptoms likewise abate and convalescence is generally rapid. Occasionally the temperature rises again after the fall, remains high for a few hours, and then falls again, the first fall is then called the *pseudo-crisis*. After the crisis resolution generally proceeds rapidly, sometimes however, it fails to do so and the physical signs of consolidation may be present for several weeks, this is known as *delayed resolution*.

Common Variations from the Usual Course of Pneumonia.—(1) In what is known as **senile pneumonia,** *i. e.*, that occurring in the aged, the temperature does not rise as high nor the pulse become as rapid and bounding as in younger patients, and there may be but little expec-

toration, nevertheless there is likely to be intense toxemia and death from exhaustion is a common outcome.

(2) **In young children** convulsions and vomiting are likely to occur with, or instead of, chills at the onset, there is likely to be little or no expectoration; stupor and intense headache are common.

(3) In what is known as **typhoid pneumonia** the toxemia is excessive and the patient's condition markedly resembles that seen in the third week of a severe attack of typhoid (hence the name); there is likely to be intense prostration, stupor, muttering delirium, subsultus tendinum and carphologia, the temperature may be very high —105° to 106° F. and the pulse weak and very frequent— 140 to 160.

(4) **In abortive or larval pneumonia** the consolidation of the lung is slight, the symptoms are mild, and the crisis occurs in two or three days.

Complications and Sequelæ.—Pleurisy is a very common complication, cardiac dilatation and delayed resolution are not unusual, endocarditis, pericarditis, meningitis, and other inflammations resulting from deposition of the germs in the organ affected occasionally occur, either as a complication or sequel. The most common sequel is empyema.

Lobular or Bronchial Pneumonia

In lobular pneumonia, as previously stated, the inflammation is confined to scattered masses of alveoli and bronchioles. Both lungs are very commonly affected. It may occur as a primary or a secondary infection.

Etiology.—Primary lobular pneumonia occurs most frequently in young children and the aged and as a terminal pneumonia in the course of chronic diseases,

such as nephritis, chronic endocarditis, etc. Secondary infections occur chiefly in connection with bronchitis, measles, whooping cough, typhoid, and smallpox. Primary infections are not uncommonly due to the pneumococcus, but secondary bronchial pneumonia is likely to be the result of lung infection with streptococci, or staphylococci, or the causative organism of the primary disease.

The predisposing causes are the same as those of lobar pneumonia.

Symptoms.—These differ from those of lobar pneumonia chiefly in the following respects: The onset is generally gradual and there is seldom a distinct chill though, especially in primary infections due to the pneumococcus, children may have convulsions; the fever is generally only moderately high and it is usually irregular and ends by lysis after an indefinite period, usually from one to three weeks; the sputum resembles that of bronchitis more nearly than that of lobar pneumonia and is seldom blood-streaked.

Prophylaxis.—Pneumonia, especially that due to the pneumococcus, is a communicable disease but, as its infectiveness is not very great, strict isolation of the patient is not essential. However great care must be taken to at once disinfect anything that becomes contaminated with sputum and anyone assisting with the care of the patient must be especially careful to hold a handkerchief in front of her nose and mouth when coughing and sneezing, because, as previously stated, people who have been in contact with a pneumonia patient may have virulent pneumococci in their mouth secretions and the disease is transmitted chiefly by droplet infection. Also the throat should be gargled frequently with an antiseptic solution. Upon recovery, the pa-

tient must be cautioned to take these precautions for some time after convalescence.

Treatment and Nursing Care.—When a chill occurs the patient should be put to bed and warmly covered. Frequently in fine weather pneumonia patients are kept out of doors the greater part of the time, when this is not possible the sick-room must be kept particularly well aired and cool, because it has been found that fresh cool air makes breathing easier, stimulates the circulation, quiets the nervous system, and promotes appetite. But, while it is desirable to have the air cool and in movement, the patient must be kept warm and draughts are to be prevented, for chilling of the body surface will increase the congestion of the lungs. To prevent chilling flannelet nightgowns are commonly used in cold weather. Antipneumonia vaccines are generally given. If the heart becomes weak cardiac stimulants will be prescribed. If there is cyanosis, a clysis or enteroclysis of sodium bicarbonate may be prescribed, for the cyanosis in pneumonia is commonly due to acidosis. Inhalations of oxygen may be ordered. Tepid or alcohol baths may be prescribed while the temperature is high, but the body must not be exposed as much as is usual under such circumstances, since it is very important to avoid chilling. If there is headache an ice-cap is kept on the head. One of the very important points in the care of pneumonia patients is to keep them quiet, for movement increases the work of the heart and this may be fatal. Therefore, when it is necessary to move or turn a patient he must not be allowed to help in the process; he must not be allowed to reach for a glass of water nor to hold it while he takes a drink; when he coughs somebody must go to him at once and with pledgets remove the sputum he cannot expectorate; when a small child is troubled with sputum in its throat

it is often well to turn it on its face for a few minutes so that the sputum may flow from its mouth, for a child under three years of age can rarely be taught to expectorate. If the patient is in pain the doctor should be notified at once for pain disturbs the patient and increases the rate of the heart action. The patient should not be permitted to talk nor should visitors be allowed without the doctor's permission. Water must be given freely. While the temperature is high the diet is generally restricted to liquids and, as the febrile stage is of short duration, it is not usually considered necessary to insist on a large intake of food. As soon as the fever subsides, however, a liberal amount of nutritious, easily digested food should be given. During the crisis there is always special danger of collapse and, therefore, at this time the patient needs careful watching; if the temperature falls rapidly, or if the pulse is at all weak, hot-water bottles should be put in the bed and cardiac stimulants are generally prescribed.

Pleurisy

(*Pleuritis*)

By pleurisy is meant inflammation of the pleura, *i. e.*, the membrane covering the lungs and lining the thoracic cavity.

Etiology.—Pleurisy is almost always a secondary disease. It may occur as the result of (1) inflammation in neighboring organs, especially the lungs, tuberculosis and pneumonia being the most common causes; (2) a general infection, the germs being brought to the pleura by the blood or lymph; (3) diseases that induce venous congestion, as chronic nephritis and cardiac diseases; (4) diseases that interfere with nutrition, as diabetes. Occasionally, however, pleurisy results from trauma

(*traumatic pleurisy*) and it may possibly be idiopathic or primary, being induced by such causes as prolonged exposure to cold and wet, but it is now believed that primary pleurisy is very rare indeed and that apparently primary cases are in reality associated with a latent tuberculosis.

The inflammatory process may be localized to a relatively small circumscribed area or it may be diffuse, even involving the membranes of both pleural cavities.

According to the nature of the exudate resulting from the inflammatory process pleurisy is known as: (1) fibrinous, plastic, or dry; (2) serofibrinous; (3) purulent, empyema, or pyothorax.

Nature of Exudate.—In fibrinous pleurisy more or less of the surface of the pleura becomes covered with a fibrinous deposit that gives rise to adhesions which, except in very slight attacks, tend to bind parts of the opposing surfaces of pleura together. In the serofibrinous type, in addition to a varying amount of fibrinous exudate, there will be an accumulation of serous fluid in the affected cavity. The amount of fluid varies from a few ounces to several pints. In favorable cases the fluid is gradually absorbed by the lymph-vessels, but when the quantity is excessive, if the fluid is not removed by aspiration, the lung may become compressed and the neighboring organs displaced. **In purulent pleurisy** the exudate consists chiefly of pus. Empyema may follow a serofibrinous pleurisy, the serous exudate being gradually transformed into pus, or pus formation may take place from the onset.

Symptoms.—These vary somewhat depending upon the cause and the type of inflammation. As a rule, the onset is marked by a sharp stabbing pain in the affected side. The pain is increased by deep breathing and it is

likely to be more pronounced and constant in fibrinous pleurisy, for it usually subsides to some extent when the inflamed membranes become separated by the fluid exudate. The breathing becomes rapid and shallow and, if the accumulation of fluid becomes excessive, there will be dyspnea and sometimes cyanosis. There is usually an irritating cough, but, if there is no associated bronchial or pulmonary disease, there is little or no expectoration. Except in the purulent type there is not usually a high fever due to the pleurisy. In empyema, however, the temperature may be high and irregular and other septic symptoms, as chills and sweats, are common.

Treatment.—The patient is kept at rest in bed. The affected side is usually strapped with adhesive plaster in

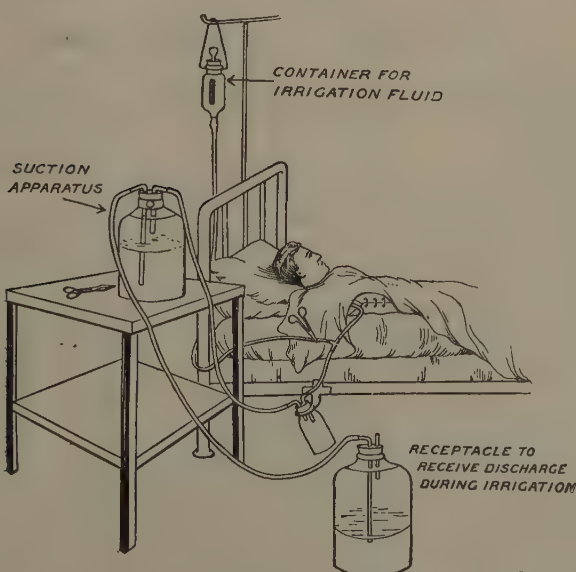


Fig. 131. Drainage in Empyema.

order to restrict the depth of the breathing movements and thus lessen pain. If necessary, saline cathartics are prescribed to favor the removal of fluid from the system and thereby hasten the absorption of the exudate. Various local external applications, as iodine and cantharides, are also sometimes used to hasten absorption and, if there is an excessive amount of fluid, aspiration is likely to be performed. In empyema, operative measures may be necessary to afford an exit for the pus and, following operation, various means of obtaining free drainage are employed, one method is shown in Fig. 131.

Here End

Jan 8-1929

Some of the More Common Diseases of the Stomach

Acute Gastritis. Acute Dyspepsia

Acute gastritis is an inflammation of the mucous membrane, and sometimes the deeper structures of the stomach.

Etiology.—The most common causes are: (1) Food—indigestible food, such as unripe fruit, will cause congestion of the gastric mucosa and acute dyspepsia (*indigestion*), but it is believed that a true gastritis is only induced when the food contains bacteria or an anaphylatoxin. Decomposed food is more likely to contain causative organisms than good food and, as slight decomposition does not always appreciably alter the flavor, food in which decomposition has started is a common cause of acute gastritis. The foods most likely to contain anaphylatoxin are crabs, lobsters, and shell fish. (2) Chemicals such as bichloride of mercury, arsenic, concentrated acids and alkalies. (3) Infectious diseases, gastritis due to this cause is designated *toxic gastritis*.

Pathology.—The mucous membrane is red and swollen and sometimes the deeper structures are also inflamed. There is excessive secretion of mucus and in severe cases there may be ecchymosis or, when the gastritis is due to irritant chemicals, profuse bleeding. In the early stages the secretion of gastric juice may be normal, but later it is inhibited.

Symptoms.—The symptoms vary according to the degree of inflammation and toxemia. In mild cases there are likely to be gastric distress, abdominal tenderness, loss of appetite, nausea, eructions of gas, vomiting, fetid breath, and coated tongue. In severe cases these symptoms are intensified and there will probably be malaise, severe abdominal pain, diarrhea, headache, intense thirst, and there may be jaundice, due to the extension of inflammation into the duodenum and consequent interference with the discharge of bile from the liver. At first the vomitus consists of sour food, later of watery fluid containing mucus and bile and, when the condition is due to irritant drugs, blood. Especially when the gastritis is due to irritant chemicals the abdominal pain is likely to be extreme and collapse is likely to occur.

Treatment.—Mild cases are likely to be relieved as soon as vomiting occurs. If it does not do so naturally it can be induced by drinking warm water or tickling the back of the throat. In more severe cases it may be necessary to wash out the stomach and to apply heat to the epigastrium. When the condition is due to poisoning by irritants, fluids must be given freely and these should include demulcent substances such as white of egg, gelatine, and barley water, and also the chemical antidote for the poison. If the gastritis is due to food, castor oil or calomel is usually prescribed and later bismuth, because it tends to temporarily coat the stomach and intestines and thus

protects them from irritation. Following even mild attacks, food is limited for some days to demulcent substances, such as barley water, arrowroot, and the like.

Chronic Gastritis

Etiology.—Chronic gastritis may be caused in many ways, such as: the constant use of indigestible food, deficient mastication of food, eating between meals, the prolonged use of excessive amounts of irritant condiments, the constant use of concentrated alcoholic drinks or strong tea; chronic diseases that induce passive congestion, such as cardiac diseases, cirrhosis of the liver, and nephritis; chronic diseases that interfere with nutrition, such as diabetes, gout, arteriosclerosis: conditions in the stomach, such as atony (*deficient muscle tone*) and gastric dilatation, that delay the passage of food into the intestine; conditions such as gastric ulcer and cancer that favor inflammation.

Pathology.—The condition in the stomach varies considerably. In what is known as **hypertrophic gastritis** the tissues composing the walls of the stomach tend to become thicker than normal, the mucous membrane is congested and it is likely to be covered with a thick, tenacious mucus. The gastric glands become dilated and their epithelial cells are likely to degenerate and, if this occurs, their secretory power will be diminished. In what is known as **atrophic gastritis** there is an excessive proliferation of fibrous tissue and thinning of the muscle tissue and mucous membrane. The fibrous tissue tends to contract and by so doing it may obliterate many of the glands. This causes what is known as **achylia,** *i. e.*, absence of gastric secretion.

Symptoms.—These vary, the more constant ones are: Variable appetite; coated tongue; bad taste in the mouth; fetor of the breath; feelings of discomfort or pain in the epigastric region, especially after eating; eructions of gas belching of acid or bitter fluid; the abdomen is often distended; there may be hyperchlohydria (*excessive secretion of HCl*); either constipation or diarrhea; and attacks of nausea and vomiting are common. The vomiting may occur before breakfast or at the height of digestion, the former is likely to be the case when the gastritis is due to the excessive use of alcohol (*alcoholic gastritis*). In advanced cases there may be a deficiency of HCl and of the gastric ferments or, in atrophic gastritis, these may be entirely lacking. Naturally, when the gastritis is pronounced, nutrition is interfered with and there is then emaciation, anemia, and general debility.

Treatment.—Regulation of the diet is one of the most important items of the treatment. When there is exacerbation of the symptoms the diet is usually restricted to milk and lime water, or milk and barley water, or peptonized milk. At other times almost any food that the patient can digest easily is allowed, but all foods are interdicted that are not easily digested (*e. g.*, pastry, fried foods, hot breads) and those that contain much cellulose, *e. g.*, coarse grains, nuts, the pulp of fruit (small amounts of cooked fruit are allowed as the cooking softens the cellulose); most vegetables contain a considerable amount of cellulose and are therefore better puréed, the use of fats has to be limited, for fat is not digested in the stomach and tends to delay gastric digestion; other articles forbidden are irritant condiments, as mustard, spices, and pepper; candies, alcoholic drinks, tea. Coffee is allowed in small amounts because the caffeic acid of coffee, unlike the tannic acid of tea, is not astringent.

If there is acid fermentation, carbohydrates have to be restricted. Eating between meals is forbidden, but when only a small amount of food can be taken at a time more than three meals will be necessary. Food enough to supply the individual's caloric requirements is to be used, but no more. Mastication should be very thorough. If there is much mucus covering the lining of the stomach a daily lavage is usually prescribed or, if the mucus is not excessive, a drink of hot sodium bicarbonate solution before breakfast may be substituted—the hot soda solution, if taken when the stomach is empty, tends to dissolve the mucus and thus favors its passage into the intestines and its subsequent elimination. Drugs which aid digestion, either by stimulating the secretion of digestive juices, or by supplying deficient constituents of the gastric juice, are prescribed. Constipation and all other conditions that are deleterious to the health must be avoided.

Peptic Ulcers

An ulcer is an open sore associated with localized destruction of tissue. **Peptic ulcers occur** in the stomach and the upper 1½ inches of the duodenum.

Etiology.—Peptic ulcers are thought to be due to (1) circumscribed malnutrition of the membrane or walls of the stomach or the portion of the duodenum that is subjected to the influence of the gastric juice, (2) the digestive action of the gastric juice. Though the membrane lining the stomach and intestines consists largely of protein, and the pepsin of the gastric juice digests protein, the healthy membrane is able to protect itself from the ferment, but when the nutrition of the membrane is interfered with the pepsin apparently has a slow digestive

action upon it and, after it becomes corroded, the underlying tissues, so that finally, if the condition is not ameliorated, the corrosion may extend entirely through the wall of the stomach or duodenum. Peptic ulcers are most likely to occur between the ages of 20 and 40.

In many instances there is only one ulcer present at a time, but there may be several and the ulcers may be either small or large. They occur most commonly near the pylorus, which is the most active part of the stomach. A small superficial ulcer may do no harm and may heal without damaging the gastric tissue sufficiently to interfere with the organ's functioning, but if the ulceration is deep the blood-vessels in the part may become involved and then bleeding frequently occurs. Enough blood may be lost to cause death, but when it is only capillaries that are corroded the amount of blood may be so small that its presence is only detected by chemical tests—this is known as occult (*hidden*) blood. The blood may be vomited (*hematemesis*) or it may be discharged into the intestines and evacuated in the feces to which, if more than a small amount is present, it gives a tarry appearance, as it is digested in the intestines, there is seldom, except possibly after a very profuse hemorrhage, bright blood in the feces. Also, if the blood vomited is not discharged soon after the hemorrhage occurs, it will be digested and the vomitus will then have the appearance of coffee grounds. Other dangers associated with peptic ulcers are: (1) perforation of the stomach or duodenal wall, if this occurs slowly exudations and adhesions are likely to form around the part and prevent the discharge of the organ's contents into the peritoneal cavity and, in such case, there is a chance that the trouble will be localized, otherwise peritonitis is likely to follow. (2) The formation of cicatrices as the ulcers heal which,

if they are around the pylorus, interfere with emptying of the stomach and lead to its dilatation or to a condition known, because of the shape that develops, as "hour-glass stomach."

Symptoms.—Occasionally gastric ulcers or their scars are found in autopsies on those who have died from other causes and who have given no history of symptoms of ulcer, therefore it would seem that small ulcers can be present without giving rise to any characteristic phenomena. Usually however some or all of the following symptoms are present: (1) Hyperacidity of the gastric juice. (2) Tenderness over the epigastrium. (3) Pain in the epigastrium, it is usually paroxysmal and it sometimes radiates to the back, it is generally increased by the ingestion of food, if more than a small amount is taken at a time, in such case the maximum intensity of pain is generally reached about 3 hours after a meal, at which time the free hydrochloric acidity is greatest, and much of the pain is due to the irritation of the acid. The pain is relieved by vomiting and the discharge of the food into the intestine, it may also be relieved by slight pressure over the epigastrium and, when the stomach is empty by taking a sma l amount of protein food, which combines with the acid present, and by taking alkalies which neutralize the acid. (4) Vomiting, this may occur at any time during digestion. (5) Hematemesis, as previously stated the blood may be occult or the bleeding so profuse that death results, about 20 per cent. of the fatal cases of gastric ulcer are due to hemorrhage. If perforation occurs there will be a severe sharp pain that is soon followed by symptoms of collapse and sometimes those of peritonitis.

Treatment.—The cause is sought and removed if possible, if there are other abnormal gastric conditions opera-

tive measures may be essential. If the health is much impaired, and following hemorrhage, rest in bed for at least two or three weeks is essential. The treatment for hemorrhage consists in keeping the patient very quiet, mentally and physically, morphine is generally prescribed because, by its depressant action on parts of the brain, it lessens anxiety and it also inhibits the activity of the stomach and intestines. Cracked ice may be given by mouth, but it should be swallowed as ice and not allowed to melt in the mouth. After hemorrhage some physicians allow nothing but ice by mouth for 2 or 3 days and feed the patient with nutrient enemata, others give 1 to 3 ounces of a mixture of equal parts of milk and cream every hour from 7 A.M. until 7 P.M. and, after 2 or 3 days, allow a soft cooked egg or a cracker with one of the morning feedings and about 3 ounces of a well cooked gruel with one of the afternoon feedings. The amount of gruel and egg are gradually increased until by the end of the first week, in addition to the milk and cream, a total of 2 or 3 eggs a day and about 9 ounces of gruel is being given. The egg and gruel are given alternately and at the same time as the milk and cream. After the first week custards, cream soups, and vegetable purées are generally allowed. The hourly feedings are maintained for some time as they tend to prevent acidity and enough food can be given in this way to maintain the nutrition without distending the stomach and causing distress. Even after convalescence is well established the diet must be carefully regulated; in most cases the dietary requirements are the same as for chronic gastritis. Alkalies, such as sodium bicarbonate and milk of magnesia, are used to neutralize the acidity of the gastric juice, and during the acute stage a dose is given every hour midway between the milk feedings.

Cancer of the Stomach

Etiology.—Irritation favors the development of cancer and thus carcinoma not uncommonly develops on or around the cicatrix of an ulcer, or associated with chronic gastritis, but some patients give no history of previous gastric disturbances. Carcinoma of the stomach occurs most frequently between the ages of 40 and 60.

Symptoms.—The onset of the symptoms may be very insidious, the first ones usually noted are: Indigestion, loss of appetite, weight and strength; a progressive anemia. As the size of the tumor increases there is likely to be pain that is augmented after a meal, this is most severe when the cancer is situated at the pylorus. Also, when the cancer is in this location it delays the passage of food into the intestines and this gives rise to flatulence and distress, because when the passage of the carbohydrate food from the stomach is delayed it undergoes fermentation, under the influence of the bacteria in the stomach, with the consequent production of first lactic acid and then CO_2. Vomiting is rare in the early stages, but common later. The vomitus is likely to have a foul odor and at times it may contain material resembling coffee grounds, which consists of digested blood, profuse hemorrhage however is rarely caused by gastric cancer. After a time there will be achylia (*absence of the ferments of the gastric juice*) and lack of secretion of HCl. Cachexia develops fairly early and the skin then assumes the peculiar characteristic appearance of this condition.

Treatment.—If the cancer is discovered in time an operation is performed and the cancerous portion of the stomach removed. If the condition is inoperable, and frequently after operation, X-ray treatments are used.

Hydrochloric acid is usually prescribed, as there is little or none secreted, and the diet is regulated in the same manner as for gastritis. Operative cases are fed by rectum or through an artificial fistula made into the intestine until the internal wound is healed.

Gastric Neuroses

(*Nervous Dyspepsia*)

People with neurasthenia and similar abnormal nervous conditions may at times have pronounced symptoms of gastric disturbance without any lesion in the stomach. The disturbances may be either sensory, secretory, or motor, and the symptoms of all three types may be present at the same time. Dyspeptic symptoms arising without any organic lesion are termed *functional disturbances*.

To understand **how disorders of the nervous system can give rise to various gastric disturbances** it must be recalled that in conditions such as neurasthenia and nerve-fag, there is often hypersensitiveness, *i. e.*, impulses arouse consciousness that ordinarily do not do so and sensations are perceived with greater intensity than normal. Also motor and secretory reflexes are sometimes augmented, but on the contrary, in some nervous disorders, such as those associated with constant worry, the sympathetic nervous system is being constantly stimulated and this tends to lessen gastric secretion and the motor activity of the stomach and intestines, but to increase the contraction of the sphincter muscles in the gastro-intestinal tract. Such conditions retard digestion and the evacuation of the stomach and intestines.

The more common sensory neuroses are: (1) **Hyperesthesia,** which is characterized by sensations of discomfort

and distress after the ingestion of food or drink. (2) **Gastralgia,** which consists of attacks of epigastric pain that occur independently of taking food. Relief is sometimes afforded by moderate pressure over the epigastrium, by taking food, or the application of hot fomentations. (3) **Nervous anorexia,** *i. e.*, lack of hunger. (4) **Bulimia or hyperporexia,** this signifies excessive hunger.

Common secretory neuroses are: (1) **Hyperchlorhydria,** in which there is excessive secretion of hydrochloric acid. If the hyperacidity is not intense there may be no symptoms, but the condition is likely to be associated with heartburn, *i. e.*, a burning sensation in the esophagus and throat due to eructions of hyperacid chyme. (2) **Hypersecretion,** in which too much gastric juice is secreted; if the condition is pronounced it is likely to cause pain and frequent vomiting of acid fluid. (3) **Hypoacidity or hypochlorhydria,** this signifies a deficiency of hydrochloric acid secretion, it interferes with digestion and is therefore likely to be associated with gastric distress and frequent eructions of gas.

The more common motor neuroses are: (1) **Peristaltic unrest,** which is characterized by loud rumbling and gurgling in the stomach after food is taken. (2) **Nervous vomiting,** this occurs without nausea or gagging. (3) Spasm of the cardia, *i. e.*, the sphincter between the esophagus and the stomach, it occurs chiefly after the taking of hot foods or drinks and may give rise to intense pain. (4) Spasm of the pylorus, in which the sphincter between the stomach and duodenum contracts while the body of the stomach is trying to force the food onward, it interferes with the emptying of the stomach and may occasion great pain. (5) **Atony of the stomach,** this is characterized by deficient tone of the gastric muscle in consequence of which the movements of the stomach are weaker than

normal and thus the passage of food into the intestine is delayed. This favors fermentation of the carbohydrate food in the stomach and consequently gives rise to flatulence and heartburn and, if the condition is allowed to continue, it may cause dilatation of the stomach and chronic gastritis. Atony may be caused by nervous conditions such as constant worry which stimulates the sympathetic system and also by depletion of the general health and frequent overdistention of the stomach by excessive amounts of food.

Treatment.—The primary essentials in the treatment of all forms of gastric neuroses are measures to improve the neurotic condition and the general health. Indigestible foods must be avoided and, though sufficient food to maintain normal nutrition must be used, excess must be avoided. Alkaline drugs, such as milk of magnesia, calcium carbonate, and sodium bicarbonate are used to neutralize the acid when there is hypersecretion of hydrochloric acid or heartburn due to the lactic acid resulting from gastric fermentation.

The More Important Diseases of the Intestines

Constipation

(*Costiveness*)

Constipation is generally defined as infrequent or difficult evacuation of feces.

The chief contributing factors are: (1) Failure to respond to the desire for defecation; (2) an insufficient intake of water; (3) reduced tone of the abdominal muscles and intestinal musculature; (4) stimulation of the sympathetic system, as by constant worry and conditions in the pelvic viscera that induce pain (*sympathetic*

stimulation lessens the motor activity of the intestinal muscle tissue, except that of the sphincter muscles in which it increases contraction); (5) hemorrhoids, rectal ulcers and fissures; (6) obstruction to the free passage of material through the intestines by tumors or a gravid uterus; (7) the too frequent use of irritant cathartics which, by accustoming the bowel to strong irritation, lessens its sensitiveness to that induced by food; (8) in some cases, it is believed, a constitutional (sometimes inherited) derangement of the peristaltic mechanism may exist without any discoverable organic lesion, endocrine factors may be partly responsible, but the nature of these is not known.

Symptoms.—These vary considerably, some persons are very little affected except when the constipation becomes extreme and prolonged, but usually there will be a sense of fullness and discomfort in the abdomen, headache, lassitude, mental depression, loss of appetite, and there may be dizziness, fetor of the breath, coating of the tongue, flatulence, if this is excessive it may cause pressure against the diaphragm and lead to disturbed functioning of the heart and breathing; in those subject to chronic constipation attacks of diarrhea are not uncommon because of the irritation of the bowel by the retained matter, in such cases the stools are likely to be watery and at least some of them will contain small hard lumps of feces; indican is usually found in the urine, this is formed in the liver from some of the products of putrefaction absorbed from the intestines.

Treatment.—The cause must be discovered and removed or avoided. The desire to defecate must be promptly responded to, those who have a tendency to constipation should endeavor to have a stool each day at the same hour, shortly after breakfast is a good time

as there is then a natural tendency for the sigmoid flexure to discharge its contents into the rectum. When other conditions do not prohibit, foods rich in cellulose should form a considerable portion of the diet. Massage of the abdomen and exercises that call the abdominal muscles into play are often helpful. The use of cathartics should be avoided as much as possible. Strychnine, which tends to increase muscle tone is often prescribed.

Diarrhea

By diarrhea is meant the passage of too frequent and too soft stools. It is usually due to some form of irritation or congestion of the intestinal mucosa or any condition that stimulates the motor nerve supply of the intestines and thus it may be induced by (1) the ingestion of irritant foods and drugs, (2) intestinal diseases, (3) chronic diseases and infectious diseases that favor congestion of the intestinal mucosa, (4) nervousness; (5) in susceptible individuals, especially young children, a sudden change from hot to cold weather may cause an attack.

Treatment.—This depends upon the cause. When it is due to food a cathartic, such as castor oil or calomel followed by salts, which act upon the entire intestinal tract, is generally prescribed.

Acute Enteritis. Cholera Morbus. Cholera Infantum

Acute enteritis consists of an acute catarrhal inflammation of the whole or a part of the intestine. When the condition is localized terms descriptive of the location are used, *e. g.*, inflammation of the duodenum is called duodenitis; of the jejunum, jejunitis; of the ileum, ileitis; of the colon, colitis; of the ileum and colon, ileocolitis;

when both small and large intestine are involved the term enterocolitis is sometimes used and, when both stomach and bowel are affected, gastroenteritis.

Etiology.—The common active causes are: Improper food, *e. g.*, unripe fruit, toxic substances produced in food by bacteria, bacteria, and irritant drugs. Predisposing causes are chilling of the body, hot weather, and in infancy dentition and malnutrition. The influence of hot weather is thought to be due chiefly to the greater ease with which food then becomes contaminated. Milk, cream, butter, meat, fish and fruit are particularly likely to undergo deleterious changes; also water is likely to be polluted with parasites in hot weather as warmth furthers their propagation.

The mucous membrane of the affected part of the intestine is congested, swollen and covered with mucus and, when the condition is due to bacterial invasion, toxins may be elaborated and absorbed.

Symptoms.—These vary somewhat with the cause and the site and extent of the inflammation. Common ones are: A rise of temperature; chills or chilly sensations; collicky abdominal pains; diarrhea; the stools are watery and contain mucus, undigested food, and sometimes small flecks of blood, they may have a very offensive odor; the abdomen becomes distended and tender; there is borborygmus (*the noise made by flatus in the bowel*); if the lower part of the colon is affected, there will be tenesmus (*ineffectual straining at stool*); there will be anorexia; intense thirst; the tongue is coated and dry; especially if the stomach is involved, there will be nausea and vomiting; if the duodenum is affected, there may be jaundice, due to interference with the discharge of bile from the bile ducts; in infants and young children there is likely to be marked prostration and emaciation.

In adults the symptoms generally subside in a few days, but in children, especially poorly nourished infants, the condition is likely to be more serious and collapse and death not infrequently occur or, if the child recovers, convalescence is likely to be prolonged.

Treatment.—When the condition is due to improper or decomposed food, either castor oil or calomel followed by salts is generally prescribed in order to hasten the elimination of the irritant. Bismuth or other material that will temporarily coat the intestine and thus protect it from irritation, is likely to be ordered as soon as the cathartic has taken effect, and, if the purging and pain are extreme, opium, also, if the condition is due to bacteria, an intestinal antiseptic, such as salol. Hot fomentations are often applied to the abdomen for the relief of pain. Food is generally withheld for some hours and, until the symptoms abate, restricted to substances that leave little residue or that are emolient, such as chicken broth, toast water, barley water, and arrowroot; later soft cooked eggs, toast, custard, and the like are allowed, but food with cellulose should be avoided for a time.

Cholera morbus is a severe enteritis **due,** as a rule, to toxic food.

The symptoms are similar to those just described, but they are more pronounced and there is frequent vomiting and intense purging; the vomitus, after any food present has been discharged, consists of a watery bile-stained fluid; the stools are at first typical of diarrhea, but as the purging continues they assume the characteristics of the rice-water stools of Asiatic cholera, *i. e.*, they contain small white flakes from the epithelium of the mucous membrane; fever may be high and prostration marked. Recovery is the rule, except in the case of the aged and those who are debilitated.

The treatment is the same as for acute enteritis.

Cholera infantum is a severe type of summer diarrhea of infants associated with enteritis. It is **due** to substances produced in milk by the action of bacteria. **Predisposing causes** are: Improper food, malnutrition, and bad hygienic surroundings.

Symptoms.—Vomiting, purging that becomes incessant, the stools are liquid and contain flakes of mucus, they have a very offensive odor; thirst is intense, due to the loss of water from the body, and, for the same reason, the urine may be suppressed; the temperature may be 104° F. or over, but the surface of the body is likely to be cold; the features become shrunken, the eyes sunken, and the pulse weak and rapid. If treatment is not effectual, convulsions are likely to occur and to be followed by coma and death. In the majority of cases death occurs within 2 or 3 days, when a child recovers convalescence is slow.

Treatment.—The stomach is lavaged, normal salt solution is given by hypodermoclysis to supply the system with fluid to replace that lost by the purging. Until vomiting ceases nothing is given by mouth but sterilized water, when vomiting is controlled barley water, albumin water, and whey are allowed in small quantities at a time, later properly modified or human milk is given. It is very important to keep the child warm in order to prevent collapse and warm baths are commonly prescribed, especially if the surface of the body is cold.

Chronic Enteritis

Chronic enteritis may be due to several causes such as repeated attacks of acute enteritis or a single severe attack: chronic congestion such as is caused by interfer-

ence with the circulation in cirrhosis of the liver, nephritis, and cardiac diseases; abnormal conditions of the intestines, such as tubercular, syphylitic, or carcinomatous ulcers; sometimes it occurs without any discoverable local cause and it has been suggested that such cases may sometimes be due to focal infections of the dental alveolar processes, or the facial sinuses, the throat, or the appendix.

Symptoms.—The symptoms generally develop gradually and they vary somewhat depending upon the severity and extent of the condition. There may be either diarrhea or constipation, usually the former, and sometimes the conditions alternate; there is usually mucus in the stools and this is especially abundant when the colon is involved; in severe cases flecks of blood are sometimes present. There is likely to be flatulence, abdominal distention, attacks of collicky pains and, when the lower part of the colon is involved, tenesmus; the tongue is likely to be coated and the appetite impaired. If the condition is not rectified there will be loss of strength, emaciation, anemia, and nervous disorders.

Treatment.—This varies somewhat with the cause of the enteritis, but in all cases the individual should avoid conditions that cause chilling of the body, because this is always likely to increase the intestinal congestion and consequently the other symptoms. A soft flannel binder adjusted snugly around the abdomen sometimes gives relief when there is flatulence and pain. The diet must be regulated, when the symptoms are pronounced only such foods as are used in acute colitis are permitted and, even when the patient is comparatively well, only very easily digested foods and those with little residue should be taken, any vegetables used should be puréed, and crackers and toast are better than bread, these and soft

cooked eggs, koumiss, and similar milk preparations usually form a large portion of the diet.

Hernia

(*Rupture*)

By hernia is meant the protrusion of an organ or a tissue through either a normal or an abnormal opening. Intestinal hernia may be either external or internal.

External hernia occurs most frequently at the umbilicus, or the inguinal or femoral rings, these parts of the abdominal wall being relatively weak. In external hernia a small portion of the bowel protrudes between the muscles and appears as a soft tumor under the skin.

Etiology.—Hernia may be caused by anything that increases intra-abdominal pressure, such as lifting heavy weights and, in debilitated subjects and young children, it may result even from straining at stool, sneezing and coughing.

As a rule hernia is easily reduced, *i. e.*, pressed back into place, but occasionally the muscles contract tightly around the protrusion and render reduction impossible. The hernia is then said to be **strangulated.** This condition is very serious both because it causes intestinal obstruction (*the passage of material through the intestine*) and because it inhibits the flow of blood into the protruding loop which is therefore likely to become gangrenous.

Symptoms.—The characteristic symptom of external hernia is the presence of the tumor. This may be the only symptom, but even a small hernia may induce irritation and stimulate the portion of the vagus nerve supplying the alimentary tract and thereby induce spasmodic contractions, exaggerated peristalsis, and vomiting.

The symptoms of strangulated hernia are described under intestinal obstruction.

Treatment for Simple Hernia.—The protrusion is pressed back into place with the fingers and a suitable truss is worn. If the hernia occurs in infancy or early childhood, there may be no further trouble, but when it occurs after six years of age recurrence is common and each recurrence makes another more probable and there is always danger of the hernia becoming strangulated. Therefore operative measures are usually advised, because the operation for a simple hernia is not a serious one, while that for strangulated hernia, which requires resection of the bowel is, and, if the operation is not performed at once, death is likely to occur.

Internal intestinal hernia is due to a coil of the intestine slipping between strands of mesentery or other folds of peritoneum, or between adhesions that have resulted from peritonitis, or between the attachment of the diaphragm and the siphoid cartilage (*diaphragmatic hernia*), in which case the bowel protrudes into the thoracic cavity. Internal hernia causes intestinal obstruction and is described under that heading.

Intestinal Obstruction

By intestinal obstruction is meant interference with the passage of feces through the intestines. The condition may be either acute or chronic.

Etiology.—Acute obstruction is most commonly due to (1) **Intussusception,** *i. e.*, one part of the bowel slips into the lumen of the adjacent portion of intestine, usually that below it. It occurs chiefly in infancy, while the walls of the intestine are weak and their mesentery attachments (*which help to hold them in place*) are imper-

fectly developed. Malnutrition is thought to be a predisposing cause for the condition occurs chiefly in poorly nourished children. The exciting cause is thought to be irregular peristalsis in which part of the bowel becomes unduly constricted while the adjoining portion is dilated. The irregular peristalsis may be promoted by overfeeding, constipation, or anything else that causes excessive irritation of the bowel. (2) **Volvulus,** *i. e.*, a coil of the intestine becomes kinked or twisted. It occurs most frequently in middle-aged men. A relaxed condition of the mesentery is thought to be a predisposing factor and irregular peristalsis the chief exciting cause, this, as previously said, is generally due to excessive irritation. (3) **Strangulated hernia,** either external or internal, described under hernia. (4) **Paresis** of the bowel, this sometimes develops after abdominal operations, and as the result of peritonitis, and occasionally it occurs as the result of depressed nervous conditions. (5) **Impaction of foreign bodies** such as gall-stones or hard substances that have been swallowed.

If obstruction due to intussusception, volvulus, or strangulated hernia is not promptly relieved, peritonitis will develop and, in the case of strangulated hernia and volvulus, also gangrene of the portion of the loop beyond the obstruction.

The more common causes of chronic obstruction are: (1) Stricture of the intestine following ulcerations such as are sometimes caused by syphilis, tuberculosis, and dysentery; (2) carcinoma or other tumors in the bowel or neighboring organs; (3) impaction of feces.

Symptoms of Acute Obstruction.—Sudden abdominal pain that is collicky at first but later continuous. Repeated vomiting, at first the vomitus consists of the stomach's contents, then a bile-stained fluid from the

duodenum, later of a dark fluid with a fecal odor from the ileum and, finally, if the obstruction is in the colon, of fecal matter (*stercoraceous vomitus*). The vomiting of the intestinal contents is due to reversed peristalsis (*i. e., towards the stomach, instead of the rectum*) promoted by the obstruction. After the portion of intestine below the obstruction is emptied there will be absolute constipation. The abdomen becomes distended and there is tympanites, this is especially marked when the obstruction is in the lower part of the bowel. The peristaltic movements of the intestine become so forced and strong that they are visible. The symptoms of collapse soon appear, *i. e.*, the face becomes pinched and anxious, the eyes sunken, the pulse weak and rapid, the skin cold and covered with sweat. Thirst is extreme and the urine scanty. The temperature varies, not infrequently it is subnormal. **In intussusception** there is also tenesmus, and blood and mucus are passed by rectum, and a sausage-shaped tumor may be felt at the point of intussusception, which is most commonly at the ileocecal valve. When the trouble is in this location a portion of the small intestine slips into the colon and, in extreme cases, the end of the invaginated bowels may be felt in the rectum. If obstruction from any cause is not promptly relieved death occurs, usually in from 3 to 6 days.

The symptoms of chronic obstruction generally develop gradually; there is increasingly severe constipation and, because of the irritation induced by the impaction, mucus is passed in the stools and sometimes blood. The stools may be ribbon-shaped or they may consist of small hard masses. The abdomen becomes distended and there are frequent collicky pains which are referred to the site of the obstruction. As the obstruction becomes pronounced

frequent attacks of vomiting are likely to occur. There will be frequent attacks of headache and other conditions associated with constipation and a gradual deterioration of the health. If the obstruction becomes complete the symptoms of acute obstruction will develop. Occasionally the irritation produced at the point of obstruction causes ulceration of the intestinal wall and this may result in perforation of the wall and consequent peritonitis.

End

Appendicitis

Appendicitis implies inflammation of the vermiform appendix. It may be either acute or chronic. It is more common in males and between the ages of 15 and 30.

Etiology.—Gangrene of the appendix may occur as the result of its twisting or kinking for, as the blood supply to the appendix is very limited, these conditions very readily shut off the circulation in the portion beyond the obstruction, but a true acute appendicitis is always the result of bacterial infection. The organisms most commonly responsible are the colon bacillus, the staphylococcus pyogenes and the streptococcus pyogenes. It is believed that many cases of appendicitis, both acute and chronic, occur as a secondary focus of infection, the primary focus being either the tonsils, the dental alveoli, or the sinuses in the facial bones, the colon bacillus is a normal habitat of the intestines and can easily enter the appendix from the cecum, but if the appendix tissues are normal it may not do any harm, unfortunately the general structure and position of the appendix are such that it is frequently the seat of a non-suppurative catarrhal inflammation or filled with scar tissue resulting from such inflammation and in this case an acute appendicitis is

easily induced. The conditions just described are typical of those existing in chronic appendicitis. They may be induced by (1) the entrance of non-infective irritant material from the cecum, (2) bacteria that are not of a sufficiently virulent type to induce a suppurative process, (3) the after results of an acute inflammation.

Pathology of Acute Appendicitis.—A mild infection may subside by resolution, but even in such case the conditions described in the preceding paragraph are likely to be left and, in addition, if the inflammatory process involves the external surface of the appendix, there is likely to be an exudation of material from the blood that promotes adhesions which bind the appendix, either temporarily or permanently, to the neighboring parts. If the inflammation is severe the adjacent folds of peritoneum may become the site of a non-suppurative inflammation which is associated with profuse exudation of fibrin and other material from the blood in consequence of which some of the loops of intestine surrounding the appendix are likely to become stuck together and thus form a wall around it. If the inflammatory process in the appendix does not subside by resolution suppuration occurs, the appendix wall is then likely to become more or less disintegrated and its lumen distended with pus, it is then likely to rupture. If the rupture does not occur until the appendix has become encapsulated as just described the escaping pus will, at least for a time, be localized, a condition known as *appendix abscess* and as *localized peritonitis.* If the rupture occurs before encapsulation occurs or if the wall of adhesions breaks, and even slight movements of the abdominal muscles and the pressure of the pus are likely to make it do so, the pus tends to spread through the abdominal cavity and cause general peritonitis.

Symptoms.—As a rule the first symptom of acute appendicitis is a sharp sudden pain that, at first, may be referred to the whole abdomen, but later is usually localized in the right iliac region, especially to what is known as McBurney's point (*a small area midway on a line between the umbilicus and the anterior superior spine of the ileum*). The pain is soon followed by fever which usually ranges between 100° and 103° F., though it may be higher in children and in virulent infections. There will be tenderness and muscular rigidity over the appendix region, vomiting, and either constipation or diarrhea. The patient almost invariably lies either on the back or the right side with the right knee flexed, for this relaxes the muscles covering the painful region. Leucocytosis, especially of the polynuclears, is normally present.

If perforation occurs the pain becomes extreme, sometimes very suddenly at the time of the perforation, if peritonitis occurs the symptoms described under acute peritonitis will follow.

When the appendix is gangrenous the symptoms are usually very acute, pain is extreme, the pulse rapid and tense, but the temperature may not rise above 102° or 103° F., the leucocyte count is often comparatively low.

Symptoms of Chronic Appendicitis.—These are largely due to reflexes induced by the abnormal condition; this is especially the case when the appendix is bound by adhesions to other organs. They are likely to consist chiefly of digestive disturbances and constipation or, occasionally, diarrhea. Also vomiting is common and there may be tenderness over the appendix region and sometimes pain and, if the condition is due to bacteria, there may be frequent slight rises of temperature and moderate leucocytosis.

Treatment.—In the vast majority of cases of both acute and chronic appendicitis operation is advised, because (1) chronic conditions favor acute attacks and, no matter how mild an acute attack is, it predisposes the individual to recurrence and possibly more severe attacks; (2) though in some of the lower animals the appendix is of use in digestion, it is thought that in man it has no function and its removal has no bad effects on the health, (3) except when the appendix is full of pus, the operation is not a serious one. Except when the symptoms during an acute attack are severe and indicate increasing suppuration or gangrene, an operation is not performed until the acute symptoms subside. Until they have the patient is kept very quite (*this is important, in order to prevent rupture*) with an ice-cap over the appendix region. If the pain is severe morphine is prescribed after it has been definitely decided that operative measures are not necessary, but not until then, as it would mask the progress of the symptoms. Enemata may be prescribed to relieve constipation but cathartics are not used until the acute symptoms have subsided, it being very important not to increase peristalsis unnecessarily. For the same reason nothing but ice and very small amounts of water are allowed by mouth.

Peritonitis

Acute Peritonitis

Peritonitis implies inflammation of the peritoneum. It may be either acute or chronic.

Etiology.—Acute peritonitis is always due to infection with microörganisms. These may reach the peritoneum because of: (1) Perforation of a gastric or

intestinal ulcer (*there are always germs in these organs*); (2) rupture of a suppurating appendix or of an abscess in any of the other abdominal organs, or the pelvic organs, or perforation of the diaphragm as the result of empyema or a lung abscess; (3) extension of inflammation from adjacent organs; (4) the presence of bacteria in the blood, as occurs in some of the general infections, such as septicemia, tuberculosis, etc.; (5) wounds in the exterior of the abdomen.

The inflammation may be general or localized. Even when an abscess ruptures into the peritoneal cavity the pus, at least for a time, may be held as it were in a sac because the exudates from the inflamed surfaces glue the peritoneal bands and coils of intestines in the vicinity together. The constitutional symptoms are less severe when the condition is localized than when it is general.

Symptoms.—There will be severe abdominal pain and tenderness, tympanites becomes marked and the abdomen greatly distended. The patient generally lies on the back with the knees drawn up, for this relaxes the tension of the abdominal muscles and therefore reduces the pressure on the underlying parts. Vomiting is likely to be almost constant and hiccough is common. The temperature rises rapidly to about 104° or 105° F., but it becomes somewhat lower later; the pulse becomes rapid, "wiry," and weak; the breathing frequent and shallow; the expression anxious; the tongue dry and sometimes fissured; there may be diarrhea, but constipation is more common. In severe cases the symptoms of collapse soon develop and the temperature falls, the pulse becomes exceedingly feeble and rapid, the skin cold, perspiration profuse, and there may be suppression of urine.

Treatment.—An operation to afford drainage for the pus is performed as soon as possible. In the meantime

the patient must be kept very quiet. After operation he is placed in a position to facilitate drainage and to keep the pus away from the lymph-nodes in the upper part of the abdomen where they are comparatively abundant, for they absorb the septic matter and this increases the constitutional symptoms; either Fowler's position, the prone position, or the lateral position is generally used. Pressure upon the abdomen is likely to increase pain and therefore it is often essential to use a cradle to remove the weight of the bedclothes. Hot stupes are commonly prescribed for the relief of pain and tympanites, these must not be heavy, a piece of oil muslin or other protective is placed over the dressing. Enteroclysis is generally prescribed to provide the body with fluid and thus maintain the normal tension in the blood-vessels and further the action of the kidneys which aids in the elimination of the toxins. If vomiting is persistent, the stomach is usually lavaged. Ice is given to relieve thirst, but drink and food by mouth are generally withheld for a time, because they are likely to incite vomiting and the consequent movement of the stomach and intestines furthers the absorption of septic material. Nutritive enemata are usually prescribed. Symptoms of collapse must be watched for and reported at once should they become evident, and hot-water bottles must be put around the patient. An intravenous infusion and heart stimulants are likely to be prescribed.

Chronic Peritonitis

Etiology.—Tuberculosis and cancer are the two most common causes of chronic peritonitis, but it may follow an acute attack and it may be due to syphilis.

The nature of existing conditions varies somewhat with

the cause, but in all forms the folds of peritoneum are more or less thickened and sometimes contracted and the abdominal organs are stuck together with adhesions. There is a varying amount of exudate which is encapsulated in the sacs formed by the adhesions.

Symptoms.—The usual ones are: Abdominal pain and tenderness, abdominal distention, either constipation or diarrhea, flatulence, sometimes slight fever, anemia, and emaciation.

The treatment depends upon the cause and extent of the condition. Surgical measures are often resorted to.

Tubercular peritonitis is more fully described under Tuberculosis.

Some of the More Important Diseases of the Liver

Jaundice

Jaundice is not a disease, but a condition due to interference with the free discharge of bile into the intestine and its consequent absorption by the blood, deposition in the tissues, and elimination in the urine and sweat.

There are two **main types,** viz., obstructive jaundice and toxic or hematogenous jaundice.

Obstructive jaundice is caused by an obstruction that interferes to a varying degree with the discharge of bile from the main hepatic ducts into the duodenum in consequence of which the bile is dammed back into the ducts and gall bladder and absorbed by the blood. The obstruction may be due to various causes, such as the presence of gall-stones or parasites in the ducts, inflammation of the ducts (*cholangitis*) or of the duodenum at the orifice of the common bile-duct, the pressure of tumors or of

enlarged organs or misplaced organs, or of kinking or twisting of the common bile-duct.

Toxemic jaundice is so called because it is brought about by toxic substances, it is sometimes called hematogenous (*produced by the blood*) because in many instances the poisons responsible for the condition induce hemolysis (*excessive destruction of red corpuscles*) and the débris of the disintegrated cells blocks the minute passages through which the bile passes from the secretory cells of the liver to the ducts. In other instances the obstruction of these minute ducts is due to swelling of the liver cells and the congestion of its blood-vessels. Toxemic jaundice may be induced by certain infectious diseases, notably yellow fever, some inorganic poisons, especially phosphorus, and the venom of some snakes.

Symptoms.—The skin and conjunctiva become yellow and, in severe cases, other mucous membranes are discolored. The sweat and sometimes the tears, saliva, bronchial mucus, and in nursing women the milk may be stained, also bile is present in the urine, but owing to color of the latter it may only cause discoloration when present in large amounts, even small amounts, however, can be detected by the Gmelin test for bile. The color changes of the urine vary from a light greenish-yellow to a dark blackish-green. The feces is of a grayish color, a very pale gray when the bile is completely obstructed, because of the absence of bile, which is its natural coloring matter. Constipation is common, because, when in the intestine, bile acts as a peristaltic stimulant and the intestines are deprived of this stimulant when the bile is not discharged from the liver. The feces is likely to have a strong offensive odor, because of the excessive putrefaction its protein constituents undergo when their elimination is delayed. There is likely to be flatulence

and also digestive disturbances, anorexia, and nausea. Pruritis (*itching*) of the skin, urticaria and other skin disorders are common, because of the irritants in the blood. The pulse may be slower than usual, sometimes below forty; the breathing also may be slower than normal; languor, mental depression, and headache are common. In severe affections there may be disturbance of vision, especially what is known as *xanthopia* or *yellow vision*, this is thought to be due to toxic disturbance of the retina. Blood, when shed does not clot as quickly as normal.

In toxic jaundice there is not as much obstruction to the discharge of bile as there is in the obstructive type and therefore the discoloration of the skin, etc., is less marked and the color of the feces may be about normal, but the mental symptoms may be more pronounced and occasionally there may be coma and delirium.

Treatment.—This depends largely upon the cause, but in all cases the diet is restricted to light, easily digested foods, and fats must be avoided. Water should be taken freely and cathartics, usually salines, are prescribed to prevent constipation. Various external applications, as carbolized vaseline and an alcoholic solution of menthol, are used to relieve itching.

Icterus Neonatorum

By icterus neonatorum is meant jaundice of the newborn. There are two varieties, viz., physiological icterus and pathological icterus. **Physiological icterus** is common and is thought to be due to such **causes** as (1) the passage of blood containing bile pigment from the liver directly into the vena cava through the ductus venosus, *i e*, one of the vessels existing in fetal life that closes a

few days after birth; (2) congestion of the liver which favors the absorption of bile. Icterus may appear a few hours after birth or not for 2 or 3 days. The condition generally clears up in a few days without treatment. **Pathological icterus** is much more serious, in fact it is likely to be fatal, for it is **commonly due** to some abnormal structural defect of the bile-ducts, or to congenital syphilis, or to some other infection that has reached the infant through the umbilical vein.

Cirrhosis of the Liver

Atrophic or Interstitial Cirrhosis

Atrophic cirrhosis of the liver follows injury of the liver cells and the consequent formation of scar tissue which, after a time, contracts and reduces the size of the liver and also obliterates more or less of its glandular tissue and the liver terminations of the portal vein and sometimes the hepatic ducts.

Etiology.—The most common cause of atrophic cirrhosis is the overuse of concentrated alcoholic liquors; other causes are the prolonged use of highly spiced foods and drinks and poisons such as fatty acids and other putrefactive products absorbed from the intestines. Syphilis may induce a somewhat similar condition and tuberculosis sometimes induces a cirrhosis associated with a fatty degeneration.

Symptoms.—The primary symptoms are due to interference with the circulation in the portal vein and consequently with that in the vessels of the stomach and intestines. The symptoms develop gradually, both because the condition in the liver progresses slowly and because some of the vessels in the abdominal viscera anastomose with vessels that do not pass to the liver, but

connect directly with the vena cava. These vessels become enlarged and, until the portal circulation becomes much impeded, serve fairly well as a passageway for the blood from the viscera, but gradually a passive congestion of the viscera develops. As a rule, it is chiefly this condition that is responsible for the earlier symptoms, these are: Indigestion—which gives rise to sensations of discomfort after eating, eructations of gas, nausea, vomiting, flatulence; constipation; loss of appetite; and, because of the congestion of the hemorrhoidal veins, the development of hemorrhoids. The digestive disturbances naturally give rise to ill-health and emaciation and, when the congestion in the visceral vessels becomes pronounced, hemorrhage from any of the affected organs may occur, also the congestion in the portal vessels induces ascites (*collection of fluid in the abdominal cavity*) and edema, especially of the legs. If the hepatic ducts become obstructed there will be jaundice. The glycogenic function of the liver is not, as a rule, particularly interfered with, but, after much of the organ's glandular tissue becomes obliterated, its detoxication function grows less and symptoms due to retention in the circulation of substances the liver ordinarily either changes or eliminates then become apparent, common ones are mental deterioration and, in the latter stages, delirium and coma. Death generally occurs in from 3 to 5 years from the first appearance of symptoms.

Hypertropic Cirrhosis

Etiology.—The cause of this form of cirrhosis is unknown, but it is thought to be due to some as yet undiscovered toxin. It occurs chiefly in young adults, most commonly in males.

As in the atrophic form of cirrhosis there is proliferation of a fibroid tissue, but of a variety which does not usually contract, on the contrary, the liver becomes larger than normal, sometimes very much so. The spleen also is enlarged, and its enlargement frequently precedes that of the liver.

Symptoms.—The onset of the disease is characterized by a gradual loss of strength. At first the other symptoms occur in irregular periodic attacks with intervals of comparative health between the recrudescences, but there is a gradual downward trend in the patient's condition and the intervals between attacks grow shorter and the attacks more severe as the disease progresses. The attacks are associated with pain in the liver region, fever, nausea, vomiting, coated tongue, jaundice (this is slight in the early stages, but later becomes more marked), itching of the skin. Diarrhea is common and easily provoked. The abdomen becomes distended, because of the enlarged liver and spleen and later the presence of tympanites and ascites. Some of the superficial abdominal veins become distended and, in the later stages of the disease, there may be hemorrhages from the stomach, intestines, gums and the mucous membrane of the mouth, as a rule, however the hemorrhages are not as profuse as those which occur in the atrophic form. There may also be hemorrhages into the skin (purpura). The disease may persist for years, but there is no real recovery. Death usually occurs as the result of toxemia and the final stages are marked by exhaustion, delirium, fever, and coma.

Treatment.—In all forms of cirrhosis attention to the diet is an important item in the treatment. The diet must be light, easily digested, and nutritious. The foods generally allowed are milk, eggs, bread, butter in small

amounts, light puddings, cereals, fruit and vegetables that have not a large amount of cellulose, fish, but the amount of fats and meat are restricted. During exacerbations of the disease the patient should remain in bed, paracentesis is performed when ascites is marked.

Cholelithiasis

(*Gallstones. Biliary Calculi*)

Cholelithiasis signifies the formation or presence of biliary calculi, *i. e.*, gallstones, in the gall-bladder or in the liver's ducts. **The stones consist of:** (1) Material precipitated from the bile, chiefly cholesterin, bile-salts, especially bilirubin calcium, and pigment; (2) disintegrated cells from the membrane lining the ducts or gall-bladder; (3) mucus. The **size and nature** of the stones vary considerably; they may be either as small as grains of sand (*these are often called gall-sand*) or as large as a bantam's egg; they may be soft or hard; they may be almost white or of various shades of yellow or green according to the amount of pigment deposited. There may be one stone or several hundreds. Stones may form in the ducts but, as a rule, the precipitation occurs in the gall-bladder and a stone or stones may remain in the bladder for a long time and gradually get larger by accretion. When a stone causes irritation of the bladder, the latter is likely to contract and force it out into the cystic duct, whence it passes into the hepatic ducts and thence, through the common bile duct, into the duodenum.

Etiology.—The formation of gallstones depends primarily upon (1) the limited solubility of some of the bile's constituents, notably cholesterin and bilirubin calcium; (2) increased production of these substances, which usu-

ally occurs as the result of a chronic cholecystitis due to infection by either the typhoid bacillus or the colon bacillus. Predisposing causes are conditions that interfere with the nutrition of the membrane lining the gall-bladder and ducts or that cause irritation of the membrane, or that interfere with the free discharge of bile.

Symptoms.—A stone in the bladder may cause no symptoms, but, especially if it is a large one, it may provoke sensations of discomfort and pain in the liver region and sometimes digestive disorders due to reflex disturbance of the stomach's activities. A small stone entering the ducts may cause no trouble, beyond perhaps slight pain, but, if the stone causes distention of one of the large ducts and interferes with the discharge of bile, the symptoms of biliary colic occur, these are: excruciating pain in the right side of the abdomen, it may be continuous or in paroxysms; nausea; vomiting; profuse sweating; sometimes chills and fever; and, if the stone obstructs the common bile duct, jaundice. The pain may abate, if the stone is not very large, as soon as the latter reaches the common bile duct, for the diameter of this duct is larger than that of the hepatic ducts, but another acute paroxysm is likely to occur as soon as the stone reaches the orifice opening into the duodenum, for this is very small. After the stone passes into the duodenum the pain subsides. This may be after an hour or so from the onset of the attack or not for several days. Stones may be found in the feces after an attack and very small ones may be present independently of colic.

Sometimes a stone does not pass into the intestine, but remains lodged in a small pouch in the mucous membrane that is present near the duodenal orifice. As a rule, it does not then completely close the duct and a

slight jaundice may be the only symptoms of its presence It is, however, likely to cause irritation and consequent recurrent attacks of local inflammation which obstructs the discharge of bile and then the jaundice is increased, there is usually a rise of temperature and symptoms of biliary colic may occur. This is known as *intermittent fever of Charcot.*

Sometimes a stone is too large to pass through the ducts and remains impacted there. This prolongs the biliary colic and causes severe cholangitis and, if the stone is not removed by surgical measures, it may perforate the walls of the ducts and escape into the bowel, or into the peritoneal cavity, or through the diaphragm into the lungs. This is likely to result in a localized abscess and, later, if the condition is not relieved by a surgical operation, general peritonitis.

Cholelithiasis predisposes the individual to cancer of the gall-bladder and liver, because of the irritation that the stones induce.

Treatment.—For biliary colic, morphine and, in extreme cases, chloroform inhalations are given for the relief of pain and, for the same purpose, stupes, poultices or other local hot applications are used. Symptoms of collapse must be watched for. Individuals subject to stone formation should be particularly careful of their diet because digestive disturbances tend to cause reflex irritation of the gall-bladder and, when there is any tendency to stone formation this favors the process. Also, constipation must be avoided and water should be taken freely between meals; sodium phosphate or sodium sulphate are frequently prescribed because, in addition to acting as cathartics, they are thought to inhibit the concentration of bile. If a stone becomes impacted in a duct, a surgical operation will be necessary; one is also

advised if attacks of colic are frequent because each attack increases the irritation of the bladder and ducts and favors the formation of larger stones and consequently of severe attacks of biliary colic, which may cause death from collapse, and of suppurative cholangitis and cholecystitis and cancer.

Some of the More Common Diseases of the Urinary Organs

Uremia

Uremia is a condition due to autointoxication. It occurs in those diseases of the kidneys that result in partial or complete suppression of urine, or even in the defective elimination of protein waste without actual suppression, and in any disease that interferes with the functioning of the kidneys. It may be acute, chronic, or latent.

Etiology.—The actual cause of the autointoxication is not definitely known. Theories commonly held are that it is due to (1) substances produced in the body from the retained protein waste; (2) toxic substances formed in the diseased kidneys; (3) possibly in some cases deficiency of the internal secretion of the kidneys and the consequent production of poisonous substances.

Symptoms.—These vary somewhat; **in acute uremia** there may be any or all of the following: Convulsions, these may occur suddenly or they may be preceded by muscular twitching, headache, vertigo, and nausea; coma; amaurosis (*blindness occurring without apparent lesion of the eyes*), this may occur suddenly and sight be recovered in a few days; delirium, sometimes even acute mania; dyspnea or breathing of the Cheyne-Stokes type;

a uriniferous odor to the breath; vomiting, hiccup diarrhea.

Common symptoms of chronic uremia are:—Attacks of persistent headache, vertigo, nausea, vomiting, insomnia, and sometimes mental derangement; hemiplegia or monoplegia, usually temporary, are common and are thought to be due to cerebral edema; also there may be muscular cramps, twitching of the limbs, ringing in the ears, and various skin eruptions.

In latent uremia the symptoms may not appear for the first few days of the anuria, but gradually weakness and insomnia develop and are followed by drowsiness and apathy, but the mind remains clear; there may be headache and muscular twitching, but convulsions are rare; the breath is likely to have an odor of urine.

Death will occur in a few days if the kidneys cannot be made to resume their functioning.

Treatment.—A diuretic is usually prescribed and also a quickly acting purgative, if the patient is unconscious croton oil is generally used, 1 to 2 drops, it is given in melted butter or syrup and dropped on the back of the tongue; diaphoretics, including hot baths, are used. In acute seizures phlebotomy is sometimes performed (*in order to rid the body of some of the poison that is in the blood*) and the phlebotomy is usually followed by either an intravenous infusion of saline solution or a transfusion.

Acute Nephritis

(Acute Bright's Disease)

Acute nephritis is an acute non-suppurative inflammation of the kidneys.

Etiology.—The kidneys may be injured, and acute nephritis thus caused, by: (1) various poisons such as: the

bacterial toxins produced during infectious diseases, especially by the virus of scarlet fever; the toxic substances absorbed from the lesions caused by burns; and from local infections; over-doses of certain drugs, such as mercury, arsenic, and various irritants; (2) conditions that favor congestion of the kidneys, such as prolonged exposure to cold and wet; (3) pregnancy; the nephritis of pregnancy is thought to be the result of: (a) congestion of the kidneys as the result of the increased intra-abdominal pressure; (b) some toxic substance developed in the body.

Symptoms.—These vary considerably and they may either develop gradually or suddenly, in the latter case the onset is likely to be marked by a chill followed by a slight rise of temperature; there may be pain in the back, headache, nausea; vomiting, constipation, thirst is often extreme and the mouth dry; anemia soon develops and usually edema. The latter usually appears first in the eyelids, cheeks, and ankles, later it may become more or less general. The cause of the edema is not definitely known, but it is thought to be due to: (a) retention of water and salts in the system (*the blood almost always tends to retain its normal concentration and composition and, if the excess water and salts are not excreted by the kidneys, they pass into the tissues*); (b) increased permeability of the capillaries due to their injury by the poisons occasioned by the nephritis. The urine may be voided frequently in small amounts. It is likely to have a smoky hue and it may become quite dark because of the presence of blood; it will contain albumin, casts, and larger amounts of urates than normal, but the quantity of most of its normal protein constituents and salts is likely to be diminished. Sometimes, in mild inflammations, the only symptoms are slight changes in the urine and possibly slight edema.

Common complications of acute nephritis are: **Uremia**, edema of the larynx, cardiac dilatation, bronchopneumonia.

Results.—An acute nephritis may (1) end in complete recovery, (2) pass into a chronic state, (3) end in death, the direct cause of which is usually one of the complications just mentioned.

Prophylaxis.—Important prophylactic measures are: (1) the free administration of water in toxic diseases, following the ingestion of irritant drugs, and when there are extensive burns; (2) the daily examination of the urine in acute infectious diseases and its frequent examination during pregnancy.

Treatment.—Rest in bed until the acute symptoms have subsided. The bowels must be kept free and the skin active, in order to reduce the work of the kidneys and to help rid the body of substances that the kidneys are not eliminating; therefore, cathartics, usually concentrated salines and hot packs and baths are generally given daily. Cupping and the application of hot poultices to the lumbar region are sometimes prescribed for local pain. **The diet** is a matter of great importance, the chief points to be considered being to reduce the amount of protein and salt in the diet but, nevertheless, to give enough food to supply the body's fuel and nutrient requirements. For a man, food enough to yield about 2000 calories per day is usually given, but the protein has to be limited to about 25 grams a day until the acute symptoms have subsided when it is gradually increased to about 75 grams per day. No salt is added to the food until the kidney's functioning is improved when about 2 grams per day is allowed. The chief reason for the restriction of salt is that, if it is not eliminated by the kidneys, it passes into the tissues and, by raising the osmotic pres-

sure of the tissue fluid, increases the transudation of fluid from the blood and thereby augments the edema. Tea, coffee, and alcohol stimulate the activity of the kidneys and, though this has not been definitely proven to harm these organs, the use of these beverages is generally forbidden. Spices, pepper, and mustard are also prohibited because they are eliminated through the kidneys and may possibly irritate them. The amount of beverage is generally restricted while there is edema to about 1000 c.c. per day, but if edema is not apparent, about 1500 to 2000 c.c. is allowed.

Chronic Nephritis

(*Chronic Bright's Disease*)

Chronic nephritis is characterized by a chronic progressive degeneration of some part of the kidney substance. **The existing pathological condition** varies, in some instances it is the parenchyma or functional part of the kidneys (the glomeruli and tubules) that is chiefly affected and in others a proliferation of the interstitial or connective tissue (which is practically scar tissue) at the expense of the parenchyma is the outstanding feature. When the parenchyma is the part chiefly involved the condition is sometimes referred to as *parenchymatous nephritis*, or, if it is the glomeruli that are chiefly affected, *glomerulonephritis*, or, if the tubules are the chief seat of the lesions, tubular nephritis. When the formation of scar tissue is the predominating feature the condition is known as interstitial nephritis or arteriosclerotic contracted kidney for, owing to the tendency of scar tissue to contract, the kidneys generally become smaller than normal and the nephritis follows a primary sclerosis of

the renal and other blood-vessels and consequent gradual diminution of the blood supply of the kidneys.

Etiology.—Chronic glomerulo-nephritis may follow an acute nephritis or it may develop insidiously being produced gradually by some persistent septic infection the products of which are not virulent enough to cause an acute nephritis, it is thought that the tonsils are frequently the primary focus from which the infection is derived. It is not known if non-bacterial poisons, such as drugs and abnormal products of metabolism, will induce glomerulo-nephritis, but it is thought probable. Tubular nephritis also may follow an acute nephritis or develop gradually due to injury of the kidney by irritants, either, it is believed, those of bacterial origin, such as are derived from focal infections, those due to defective metabclism, or to general infections, such as malaria, tuberculosis, and syphilis. The excessive use of alcohol and prolonged exposure to cold and wet are thought to serve as predisposing causes to both types. Both these types of nephritis occur most frequently in young adults, between 20 and 40 years of age, and men are more frequently affected than women. Interstitial or arteriosclerotic nephritis occurs as a part of a general arteriosclerosis and is therefore due to the same causes as arteriosclerosis (see under diseases of the blood-vessels). It usually begins after 40 or 50 years of age. It is more common in men than women.

Symptoms.—The symptoms of all forms of chronic nephritis are likely to develop very insidiously and vary considerably. Variations are especially common in the glomerulo and tubular types, because in glomerulo-nephritis the tubules may be more or less affected and vice versa. Those of a typical glomerulo-nephritis are about as follows: there is a gradual failure of the health

loss of weight and strength, and increasing anemia; anorexia (*loss of appetite*), and fetor of the breath, and frequent attacks of nausea, vomiting, and diarrhea are common. As the disease advances the high blood pressure characteristic of the condition, is likely to cause congestion of the cerebral vessels and consequent frequent headache, dizziness, tinnitus aurium (*ringing in the ears*) and changes in the retina that are likely to cause impairment of vision; dyspnea, cardiac palpitation, and a sense of oppression about the heart are also common, especially during the terminal stages of the disease, for the heart almost invariably becomes affected. There is usually cardiac hypertrophy (described under diseases of the heart), especially of the left ventricle, and death not uncommonly occurs from cardiac dilatation. There is not likely to be much edema until the disease is advanced and the heart begins to fail in its functioning, when this occurs there is likely to be swelling of the feet and legs and sometimes edema of the larynx and hydrothorax. Owing to the high blood pressure and abnormal condition of the walls of the blood-vessels, hemorrhage in various parts of the body may occur, especially cerebral hemorrhage (apoplexy). The urine is generally pale in color and abundant, frequent micturition, especially at night (*nocturia*) is often one of the first symptoms of the disease. However, the amount of urea and other nitrogenous waste products and sodium chloride in the urine become increasingly diminished; there is usually some albumin in the urine, though it may be absent at times, this is also true of casts. Uremia is likely to develop as soon as the elimination of protein waste becomes much reduced.

The most important differences in the **symptoms of tubular nephritis** from those of glomerulo-nephritis are:

edema usually develops early in tubular nephritis and is likely to be very pronounced; the blood pressure may be about normal and therefore the conditions due to the high blood pressure observed in glomerulo-nephritis are usually lacking in tubular; the urine is diminished in quantity and usually contains a considerable amount of albumin and casts, but the excretion of protein waste may not be markedly diminished; retinitis and uremia are not common complications, while complications due to dropsy and edema are especially frequent, especially edema of the lungs and hydrothorax.

Early symptoms of arteriosclerotic or interstitial nephritis are: undue tendency to fatigue, palpitation on exertion, headache, dizziness, and neuralgia. Later, gastro-intestinal disturbances are likely to be frequent and general impairment of the health gradually takes place. As the sclerotic condition of the blood-vessels which is always associated with this form of nephritis, becomes pronounced, the functioning of the heart and, consequently, the circulation will be seriously affected and then there will be dyspnea, discomfort around the heart; there may be hemorrhages from mucous membranes and into the brain (*apoplexy*). The breath may have a uriniferous odor. The amount of urine voided may be normal, but polyuria, especially nocturia, is common. The excretion of protein waste and salts is likely to be diminished in the later stages of the disease, but not to the extent that occurs in glomerulo-nephritis and therefore uremia is not a very common complication. When death occurs it is usually due to cardiac complications, or apoplexy, or other condition induced by the sclerotic arteries, or to some intercurrent disease.

Progress of Chronic Nephritis.—As a rule, the abnormal conditions of the kidneys characteristic of the

different types of chronic nephritis develop insidiously and, if the disease is diagnosed early and proper treatment carried out, the severity of the symptoms may be averted, at any rate for several years. Even after the symptoms become quite pronounced they may possibly be greatly relieved by proper care and the patient live for a number of years and be fairly well a great part of the time, but exposure to cold and wet, indiscretions in the diet, prolonged worry and other causes of sympathetic stimulation (*which tend to cause vasoconstriction*) or any indisposition is likely to cause recrudescence of the symptoms and death is likely to occur from uremia or other complication or intercurrent disease.

Treatment.—The special aims of the treatment are to lessen the work of the kidneys and heart, to reduce the amount of protein waste, to prevent edema. During exacerbations of the disease rest in bed is essential, if the dyspnea is pronounced a sitting position may be necessary and comfortable support with pillows will be required. The bowels must be kept active, when a cathartic is required a saline is usually prescribed because the saline cathartics favor the passage of fluid from the blood and it is possible that some of the end-products of protein metabolism will transude with the water. The skin must be kept active, in order to favor elimination through this channel and therefore diaphoretics and hot baths are generally prescribed. Even when the patient is feeling particularly well, he should not take more food than his mode of life requires, but he must take enough to remain well nourished. The amount of salt added to food is limited to 2 grams a day when there is no edema and, if signs of the condition appear, the salt must be cut out at once. When the patient is in comparative health, about 75 grams of protein are allowed per day, but at

other times it is usually restricted to about 50 to 25 grams. Gelatine and meat soups and broths are rarely permitted, because the protein of gelatine and meat extractives are not as useful proteins to the body as the more complex ones. Otherwise, any easily digested, nutritious food that agrees with the individual is generally allowed. Spices, mustard, pepper, tea, coffee, and alcoholic drinks are prohibited for the reasons given under acute nephritis. When there is no edema the intake of about 2000 c. c. of fluid per day is usually advised in order to dilute the substances that the kidneys must excrete, but if there is edema the amount has to be cut down to from 1000 to 800 c.c. per day. At all times patients with chronic nephritis should be warmly clad and should avoid fatigue and exposure to cold and wet.

Nephrolithiasis

(*Renal Calculi*)

Renal calculi (kidney stones) are **due** to the deposition of solid matter from the urine in the substance of the kidney or in the kidney pelvis. The stones may form in only one kidney or in both kidneys. There may be only one stone or several and their formation may continue indefinitely. The **size** of the stones varies from the dimensions of coarse sand (*these are known as gravel*) to the size of a large bean. Their **composition** also varies, some consisting chiefly of uric acid crystals, others of oxalate of lime or of some of the other salts that are commonly held in solution in the urine.

Etiology.—The causes of the precipitation are supposed to be: (1) The presence of some insoluble substance, such as mucus, pus, bacteria, or blood; (2) failure to drink sufficient water to prevent a high concentration of the

urine; (3) excessive acidity of the urine favors the precipitation of uric acid crystals.

Symptoms.—Gravel and small calculi may cause no symptoms, but larger calculi are likely to induce an ache and dragging pain in the kidney region and they may cause pyelitis (*inflammation of the pelvis of the kidney*). The most characteristic symptoms are those constituting what is known as **renal colic,** which occurs when the passage of a stone through the ureter is interfered with. There is then excruciating pain which induces profuse sweating, nausea, vomiting, a small rapid pulse, and faintness, and pregnant women are likely to abort. As a rule, urine is voided frequently in small amounts, but there may be suppression. The urine is likely to contain blood, gravel, and mucus. **The duration of an attack** depends upon the speed with which the stone reaches the bladder, this may occur in a short time or not for several days; occasionally a stone becomes impacted in the ureter and a surgical operation is necessary to remove it. As soon as the stone reaches the bladder the symptoms subside, but they may recur when the stone enters the urethra. Occasionally, it remains in the bladder it is then known as a *vesical calculus*. It may stay there indefinitely and cause no symptoms unless it gets into the urethra.

Prophylaxis and Treatment.—The chief prophylactic measure that an individual subject to nephrolithiasis should take is to drink all the water possible, alkaline waters should be used freely when the stones consist of uric acid, while benzoic acid or boric acid are frequently prescribed when the stones are of alkaline composition. During an attack of colic the chief aims of the treatment are to relieve pain and to relax the spasmodic contractions of the ureter, which are stimulated by the presence of the

stone. Morphine is generally prescribed for the relief of pain or, if this is not intense, phenacetine may be substituted, while, if it is extreme, inhalations of chloroform are sometimes given. Local hot applications to the lumbar region are also prescribed and must be used with care for, when the pain is severe, the patient is likely to crave intense heat and does not mind the burning sensation. Atropine is generally prescribed to lessen the spasmodic contractions of the ureter. A liberal supply of water and hot drinks, as tea and coffee, should be given. The pulse must be watched for, especially if the patient is weakly, there is danger of collapse. As previously stated, a surgical operation may be required.

Nephroptosis

(Movable Kidney. Floating Kidney)

The term nephroptosis is derived from two Greek words signifying kidney and falling. **It is applied to** a condition in which a kidney is too freely movable. As a rule only one kidney is affected usually the right one.

Etiology.—The most common causes of the condition are: (1) A loss of fat from around the kidney, such as occurs during illness in connection with general emaciation; (2) lifting heavy weights; (3) frequent pregnancies: (4) relaxed abdominal muscles.

Symptoms.—There may be few if any symptoms, especially if the kidney is not much displaced, but there is likely to be a dragging pain in the lumbar region which becomes worse on exertion, and there may be nervous symptoms similar to those of neurasthenia. The nervous condition may be partly the result of nerve fag, due to the constant inflow of impulses to the central nervous system from the displaced organ. Occasionally, hydro-

nephrosis (*distention of the pelvis of the kidney with urine*) occurs as the result of a temporary kinking of the ureter, this is likely to cause a condition resembling the renal colic occasioned by the passage of a calculus through the ureter.

Treatment.—Measures to improve the general health are very essential and also a liberal diet containing all the fat that the invididual can take. A suitable belt with an attached pad is sometimes worn until the condition improves. Occasionally a surgical operation (*nephrorrhaphy*) is necessary.

Cystitis

By cystitis is meant inflammation of the urinary bladder.

Etiology.—Cystitis is caused by bacterial infection. The bacillus coli and the staphylococcus being the organisms most commonly responsible. The germs may reach the bladder in the urine when there is inflammation of the kidneys, or they may be deposited from the blood, or enter through the urethra. The most common causes of infection by way of the urethra are (1) inflammation of the urethra, (2) the introduction of an unsterile catheter into the bladder. Irritation of the bladder, as by irritant drugs or a calculus, will induce predisposing conditions.

The inflammation may be confined to the mucous membrane lining the bladder, but in severe infections it may involve the deeper tissues. The condition may be acute or chronic.

Symptoms.—The usual ones are: tenderness over the bladder and sometimes local pain, especially while voiding urine, at which time there is also likely to be a burning

sensation; micturition is usually frequent, in some cases the desire to void urine being almost constantly present, but occasionally there is difficulty in voiding. There may be blood in the urine. If the infection is severe there may be fever and the usual associated conditions.

Treatment.—During an acute attack rest in bed is essential until the symptoms abate. A liberal amount of water should be taken each day in order to keep the urine as dilute as possible. A urinary antiseptic is generally prescribed and also the irrigation of the bladder at stated intervals with a warm antiseptic solution. When the pain is continuous a hot sitz bath or the application of hot fomentations to the pubic region is usually prescribed.

Some of the More Common Diseases of Metabolism

Diabetes Mellitus

Diabetes mellitus is a nutritional disorder characterized especially by hyperglycemia (*excess sugar in the blood*), glycosuria (*glucose in the urine*), polyuria (*the excretion of large amounts of urine*), and a tendency to acidosis.

It is most common between the ages of 30 and 60, but it may develop in old age and in childhood.

Etiology.—Autopsies on fatal cases of diabetes reveal various abnormal conditions. In the majority of cases there is disease of the pancreas that involves the isles of Langerhans, some authorities state that this condition is present in all true cases of diabetes and that it is the chief active cause; abnormal conditions of the liver exist in most cases; nephritis is found in about one-half of the

fatal cases; tumors or degenerative changes are frequently found in the floor of the fourth ventricle or at the base of the cerebrum. **Predisposing causes** seem to be heredity, sedentary living, infectious diseases, gout, nervousness, shock, worry, injury to the central nervous system.

It will be recalled that: (1) if there is an excess of glucose in the blood, even under normal conditions, it will be eliminated in the urine; (2) normally the liver and, to some extent, the muscles, prevent excess glucose in the blood by changing it to glycogen and storing the latter until the blood needs glucose to replace that lost to the tissues; (3) the nervous system helps to regulate the storage of glycogen and output of glucose, (4) the glucose passing from the blood into the tissues is there split to acid, under the influence of the internal secretion of the pancreas, and the acids are oxidized to CO_2 and H_2O, with the liberation of heat and energy; (5) fats cease to be oxidized properly if the oxidation of glucose becomes much below par, it is thought that the heat evolved by the oxidation of glucose may be essential for that of fats; (6) when the fats are not properly oxidized acetone, diacetic acid, and betaoxybutyric acid are formed; (7) these acids unite with the basic alkalies of the blood and this interferes with the absorption of CO_2 from the tissues because, normally, the CO_2 combines with the alkalies; (8) when the CO_2 accumulates in the tissues, the oxygen does not pass into the latter in the normal manner, if the condition becomes extreme symptoms similar to those of asphyxia may be induced and the patient becomes unconscious, this condition is known as diabetic coma; (9) the excretion of more than small amounts of glucose in the urine induces polyuria, which of course involves the removal of excessive amounts of water from the blood and

therefore increases its concentration; as the result of this fluid passes from the tissues into the blood and this creates intense thirst, interferes with nutrition and limits the amounts of fluid that the glands can obtain for their secretions. Most of the symptoms of the disease are due to the results of loss of water from the system and, in extreme cases, the loss of free alkalies from the blood, because of their combination with the acids derived from the defective metabolism of fats, this condition is known as *acidosis*.

Symptoms.—The symptoms of diabetes vary according to the degree of interference with metabolism. In mild cases the onset is generally very insidious and produces few symptoms. It is quite a common occurrence for physicians to find that people applying for life insurance or those coming to them for various ailments have a mild diabetes which is only discovered when the urine is examined. If, however, more than a small amount of glucose is being excreted there will be excessive excretion of urine that contains glucose; extreme thirst, there is little perspiration and therefore the skin is harsh and dry, the mouth also is dry and the gums are likely to become retracted from the teeth and the latter tend to decay readily. Pruritis (*itching*), especially around the genitalia, is common and also boils, carbuncles, and other skin lesions. There will be digestive disturbances and constipation. The appetite is likely to be inordinate and the craving for the food that is lost from the body may be so intense that patients cannot be trusted not to take sugar, even though they realize that it will do them harm. As the disease progresses cramps in the muscles and neuralgic pains become common, and there will usually be more or less mental impairment, drowsiness, headache, and defective vision, the latter may be due to neuritis of

the optic nerve or to abnormal conditions of the badly nourished eye tissues.

Complications.—Diabetic coma may occur at any time if the condition progresses to a point where the oxidation of fats is seriously interfered with. The primary symptoms of its onset are headache, increasing drowsiness, nausea, and vomiting; next "air-hunger" develops and the patient takes long deep breaths, there is a peculiar sweet odor to the breath, cyanosis develops, the pulse becomes feeble and rapid, stupor and then coma follow. Death is likely to occur in from a few hours to a few days. Nephritis is a common complication, and a very serious one since it necessitates the restriction of protein food. There are also likely to be diseases of the eyes, due to the defective nutrition of their tissues or of the optic nerve, and skin lesions, such as boils, ulcers, etc. If the nutrition of the tissues is much interfered with gangrene may follow even slight injuries or operations and sometimes, especially in elderly patients, gangrene of the leg occurs without any special causative factor.

Treatment.—Since, ordinarily, many of the abnormal conditions of diabetes are due to loss of water occasioned by the polyuria and this is caused by the excretion of glucose through the kidneys, if the elimination of glucose can be prevented, the abnormal conditions can be alleviated. Except in very extreme cases, some glucose can be oxidized, the quantity that can be varying in each individual according to the severity of the disease. The amount of carbohydrate food that can be eaten without the excretion of glucose in the urine is known as the *individual's carbohydrate tolerance*. It has been found that when the carbohydrate intake is kept below an individual's tolerance, other conditions being favorable, the carbohydrate tolerance may be increased and the other

symptoms modified, but even when an individual's carbohydrate tolerance has reached a fairly high level, almost anything that affects the general health, as exposure to cold and wet, illness, worry, may once more reduce the tolerance. Unfortunately, carbohydrates are not the only foods that may do harm in diabetes, because, as previously stated, when the oxidation of glucose is much interfered with, fats are not properly oxidized, and the excessive use of protein overworks the liver and kidneys, both of which organs are likely to become diseased in the course of diabetes and, in severe cases, even meat causes glycosuria. It is upon these considerations that the treatment of diabetes is based. One of the first things to be considered is the patient's mode of life. Even when feeling particularly well he should lead a quiet life, avoiding undue exertion, one reason for this being that he has to keep well nourished on a restricted diet. Nevertheless, a certain amount of exercise is essential, for it aids the circulation and increases oxidation. When there is any increase in the severity of the symptoms the patient should remain in bed. Worry and nervous excitement should be avoided, for anything that stimulates the sympathetic nervous system results in stimulation of the suprarenal capsules and the consequent discharge of glucose into the blood.

The special treatment of diabetes is largely dietetic and the first step is to make the patient fast until the urine is free from sugar, this usually takes 2 to 4 days. During the fast he is given only water, coffee or tea, bouillon, and sometimes whiskey. Special more or less routine diets are then used in order to determine the amount of carbohydrate, fat, and protein that the patient can take without hyperglycemia and glycosuria developing. Those prescribed by different physicians vary. The

general principle however, is that the amount of each of the food-stuffs is gradually increased and the urine examined daily and the blood frequently, when glucose appears in the urine it is known that the patient's carbohydrate tolerance is surpassed and the amount of carbohydrate prescribed for the daily ration is considerably lower than this. The relative amount of fat and protein prescribed varies with individual cases. Vegetables with less than 5 per cent. carbohydrates form a considerable portion of the diet, for these contain considerable amounts of non-assimilable material that adds bulk to the intestinal contents and thus tends to prevent constipation. When the patient's carbohydrate tolerance is very low, three changes of water are used when cooking the vegetables, which reduces their carbohydrate content, but this is now only done when necessary for the vitamines are also extracted and, when metabolism is defective, they are particularly essential. Various specially prepared flours, breads, etc., are now on the market and they are sometimes prescribed. It has been found that patients do better when they have regular so-called *fast days;* when the carbohydrate tolerance is low a weekly fast day is advised, otherwise, a fortnightly or monthly one may be sufficient. On fast days only such foods as thrice cooked 5 per cent. vegetables, bouillon, and coffee are allowed and these in small quantities. Patients have to be persuaded to do with little sweetening in their food, saccharin, a coal tar product is substituted for sugar, but if used in larger amounts than ½ to 1 grain daily it may be harmful. Petroleum products, agar-agar and other sea-weed preparations are used to increase the intestinal contents when there is a tendency to constipation. Drastic cathartics should not be used for they may start a diarrhea that is difficult to check.

When there is a tendency to acidosis, alkalies are prescribed.

Recently, Dr. F. G. Banting of the Toronto General Hospital, Canada, has succeeded in obtaining an extract from the pancreas of hogs which contains the principle essential for the splitting of glucose. This extract, which is known as *Insulin*, greatly increases the carbohydrate tolerance of patients to whom it is given.

Rachitis and Scorbutis

(*Rickets and Scurvy*)

The underlying pathological condition in both of these diseases seems to be defective metabolism that is marked chiefly by an inability of some of the body tissues to utilize the calcium of food in the normal manner. In rickets it is the bones that are chiefly affected and in scurvy it is principally the blood-vessels. Another disease associated with defective calcium metabolism is that known as beri-beri, in which it is the nerves that are chiefly affected. This disease, however, is rare in this country.

It should be recalled (1) that calcium is essential for: The rigidity of the bones, the rhythmic contractions of the heart and plain muscle tissue, the clotting of blood, the prevention of excessive permeability of the blood-vessels, the regulation of nerve conduction and prevention of excessive nervous irritability. (2) Calcium metabolism is apparently influenced in some way by the internal secretion of the thymus gland and by **vitamines.** *These it will be remembered are chemical substances found in most fresh foods; fat soluble A being contained chiefly in milk fats, cod-liver oil, yolk of egg, and green vegetables; water soluble B, chiefly in the seeds of plants and eggs of animals and in yeast; water soluble C*

chiefly in fresh vegetable tissues, especially fruit, tomatoes and greens, to a lesser extent in fresh milk and animals' tissues, this vitamine is very easily destroyed by high temperatures, and drying. The presence of acids, however, increases its stability and thus canned fruit and tomatoes will contain it, though other canned foods will not. Both A and B vitamines are essential for growth and to prevent rickets, B is also necessary to prevent beri-beri, C is required to prevent scurvy.

Etiology of Rachitis.—Rachitis or rickets is a disease that has its onset early in life. It is believed that a number of factors may be concerned in its development, but that lack of either or both vitamine A and B is the most common cause. Anything that interferes with a child's health will serve as a **predisposing cause,** *e. g.*, other diseases, lack of sunlight and fresh air, insufficient food, and insufficiency of protein and fat, or an excess of carbohydrate or of fat, in the diet.

Symptoms.—The more common symptoms in the early stages of rickets are: Fretfulness, disturbed sleep, hyperesthesia, profuse perspiration, especially about the head, drowsiness and apathy. The child's mental development becomes retarded and its muscles soft and flabby. Digestive disturbances are common and anemia and emaciation soon develop. The fontanels are late in closing, dentition is delayed and the teeth are rarely normal. The bones are soft and they become irregularly enlarged, especially around the wrists, ankles and knees, and at the junction of the costal cartilages and ribs. In the latter location the enlargement is chiefly in the form of nodules that have been named the *rachitic rosary*. Bending of the bones, especially of the legs and spinal column, will occur if measures are not taken to prevent it and the shape of the chest is likely to be altered. The abdomen is usu-

ally distended due to enlargement of the liver and spleen and at times to the distention of the intestines with gas, which is common on account of the relaxed condition of the abdominal and visceral muscles.

Results.—Rickets is in itself rarely fatal and the progress of the disease tends to be arrested spontaneously after the third year, but it undermines the health and thus predisposes the child to infection and the deformities arising before its arrest are often permanent.

Treatment.—The child must be given the correct food required for its age and kept in the open air as much as possible, proper bathing and the prevention of constipation are also essential. To prevent deformities the child must not be allowed to stand until its bones are strong enough to bear its weight without becoming bent and massage and corrective exercises are used to overcome any existing deformities and to improve the circulation and nutrition.

Etiology of Scorbutis or Scurvy.—It is now believed that scurvy is usually, if not always, due to a deficiency of the C vitamine in the food. In adults scurvy occurs chiefly in cold countries where the people use preserved foods the greater part of the year. In infants it usually follows the prolonged use of sterilized milk or proprietary infant foods.

Symptoms.—**In adults,** the gums become soft and swollen and bleed frequently and the teeth tend to become loose, and in severe cases there may be hemorrhage from mucous membranes and into the skin. The loss of blood induces anemia and general debility.

In infancy there will be: hypersensitiveness, the infant cries when it is handled and is inclined to keep its legs and arms flexed and to cry if any attempt is made to move them; the ends of the long bones soon show swell-

ings and, in severe cases, petechial spots (*due to capillary bleeding*) may appear in the skin and there may be blood in the urine and feces, but until the teeth appear there is not as much bleeding from the gums as in adults. In the early stages of the disease the child does not usually show evidence of malnutrition, but if it does not receive proper treatment, anemia develops and death is likely to occur in a short time, on the other hand, if there are no complications, recovery is usually rapid as soon as proper treatment is started.

Treatment.—The chief item in the treatment is the diet. This, for older people, must include liberal amounts of fresh fruit and vegetables. Infants are given orange juice or tomato juice and human or properly modified fresh cow's milk. Astringent mouth washes are prescribed if necessary and proper care of the mouth is very essential.

Exophthalmic Goiter

Graves' Disease. Thyrotoxicosis)

Exophthalmic goiter is especially characterized by: (1) Changes in the thyroid gland (*these usually include hyperplasia*), (2) exophthalmos (*protrusion of the eyeballs*), increased rate of basic metabolism, (4) tachycardia (*increased frequency of the heart beat*), (5) nervousness and (6) muscular tremors.

The disease is more common in women than in men and between the ages of 25 and 35.

Etiology.—Graves' disease is largely a thyrotoxicosis (*poisoning by thyroid secretion*) due, it is believed, to excessive thyroid secretion, but some investigators believe that some of the symptoms are due to other, as yet undiscovered causes. There is usually some enlargement

of the thyroid gland, but the severity of the symptoms is not in proportion to the enlargement. The cause of the thyroid condition is not definitely known. It not infrequently follows sudden intense fright, shock, intense grief, worry, and depressing diseases and it has been suggested that stimulation of the sympathetic nervous system is the primary cause, but many physicians believe that, though this may be a powerful factor, it can only produce the condition in those predisposed. It has been suggested that the predisposition may be due to some toxin, possibly an intestinal putrefactive product.

There are 2 **forms** of the disease, viz., acute and chronic, the latter is the more common.

Symptoms.—In the chronic form of the disease there is usually a gradually increasing tachycardia until in some patients the average rate of the pulse is between 110 and 150 and it is increased on exertion. Anemia develops and this and the rapid heart action are likely to promote cardiac hypertrophy; cardiac palpitation is pronounced and pulsation in the carotids may be visible. Exophthalmos becomes marked, so much so in some cases that the lids do not close properly, also there is widening of the palpebral fissure, which gives the eyes a fixed staring expression, and the normal movements of the eyes may be interfered with. Nervousness is likely to be extreme and is manifested in different ways, such as twitching of the muscles, tremors of the fingers and hands, insomnia, diaphoresis, and in advanced stages of the disease, delirium and even insanity may develop. The appetite may be voracious, but nevertheless there is likely to be a loss of weight, because of the increased metabolism; a tendency to attacks of diarrhea and vomiting is common. At times there may be glucose and albumin in the urine. A rise of temperature is easily pro-

moted. If treatment is not effectual, the disease tends to run a protracted course.

In mild cases, for a long time, the only symptoms may be a rather rapid pulse, nervousness, and a slight exophthalmos.

In the acute type, the onset is likely to be sudden and the symptoms develop rapidly and in an exaggerated form, and, if treatment is not effective, death may occur in a few weeks, usually from cardiac dilatation.

Treatment.—Physical and mental repose are essential. Hot packs and baths are sometimes used to overcome insomnia. Various antithyroid preparations and X-ray treatments are likely to be tried and, if these are not successful, operative measures are resorted to. These sometimes consist in ligating some of the vessels connected with the thyroid and thus limiting its blood supply, but more commonly part of the thyroid is removed. It is especially important that the patients live under the most hygienic conditions and excessive physical exercise and excitement be avoided. When the symptoms are pronounced absolute rest in bed is essential.

Massage

The "Swedish movement cure" was introduced into Sweden, in 1813, by Peter Henrik Ling, and was revised, in 1860, by Mezger of Amsterdam, but the movements which they practiced and taught were not original. Their fundamental principles were the same as those described in Chinese writings three thousand years earlier; the same as those used by the Brahmins of India, by the Egyptian priests, by Hippocrates, Galen, Rufus of Ephesus, and other physicians of ancient Rome and Greece, and by Hoffman and other noted physicians of the Middle Ages.

To be an expert masseuse requires a thorough knowledge of anatomy, and constant practice. The limited number of lessons in massage generally included in the curriculum of a nurse's course does not fit her to undertake the treatment of severe cases. The object of these lessons is simply to teach those elementary movements of massage which enter largely into the treatment of nervous diseases and of diseases requiring stimulation of the circulation, and which are employed where ankylosis of the joints is liable to complicate accident or disease.

Before taking up the study of massage, it is necessary to have a general idea of the anatomy of the body, to know the position of the bones, the origin and insertion of the principal muscles, and the location of the larger arteries, veins, and nerves, and their functions.

Medical gymnastics, known variously as "Swedish movements," "movement cure," etc., is "a systematic exercise of the muscles and other tissues of the body for therapeutic purposes."

Some authors make a distinction between Swedish movements and massage, including under the former class the active movements, and under the latter the five primary passive movements. Others class all movements, both active and passive, under the heading of "medical gymnastics," thus:

Medical Gymnastics

Passive Movements.	1.	Effleurage, or stroking	Massage.
	2.	Petrissage, or kneading	
	3.	Friction, or rubbing	
	4.	Tapotement, or percussion	
	5.	Pressure	
These Movements May be either Active or Passive.	6.	Vibration	Swedish Movements.
	7.	Circumduction	
	8.	Rotation	
	9.	Flexion	
	10.	Extension	
Active Movements are either	1.	Assistive	
	2.	Single or	
	3.	Resistive	

Points to be Remembered

Massage must never be given without a doctor's order. Its use is counterindicated in all inflammatory conditions associated with pus, in skin diseases, diseases accompanied with a rash, or parasitic diseases.

Before beginning a treatment, place the patient in a comfortable position, and sit in a comfortable position

yourself, neither too far away from him nor too near him.

Always wash your hands before and after a treatment.

Lubricants may be used if desired, but, unless ordered for therapeutic purposes, these are not necessary unless the skin is dry. If the skin is moist it is often desirable to employ talcum powder.

In beginning a manipulation, use moderate force, increase the force gradually, and then, toward the end of the movement, decrease it as gradually.

Begin and end all treatment with effleurage.

Local treatment is given for from ten to twenty minutes.

General treatment is given for from half an hour to one hour.

Before giving local massage, loosen all bands around the part to be manipulated, and give effleurage and petrissage to the adjacent parts between it and the heart.

Always give effleurage, petrissage, and friction directly on the skin.

In general massage, the patient should wear a loose gown.

Never expose your patient.

Carry out a general treatment in the following order: legs, feet, arms, chest, abdomen, back.

Effleurage.—Effleurage is given from the periphery toward the heart. It may be given with the palms of one or both hands, or with the cushions of the fingers or thumbs.

EFFECTS.
- The superficial circulation is improved.
- Exudations are pushed along in the capillaries.
- The cutaneous nerves are soothed by light effleurage given for a short time, but are irritated by prolonged treatment.

Effleurage is given at the beginning and ending of all treatments.

Petrissage.—Petrissage, or kneading, can be done with one hand or both hands, with the cushions of the fingers or of the thumb. The muscles are stretched away from the bone in the direction of the venous current, and the blood-vessels are alternately emptied and refilled by the alternate pressure and relaxation of the operator's hand while performing the movement.

In giving petrissage, begin above and work downward.

Never allow the hand to move on the skin. When one grasp of the muscle is thoroughly kneaded, relax the hand and take a new grasp, including a portion of the former one.

Use both hands whenever possible.

Make the greatest pressure while moving the muscle in the direction of the venous current.

EFFECTS.	The circulation is improved.
	Blood pressure is diminished.
	Mental activity is lessened.
	The absorption of waste products is hastened.
	Nerves and muscles are strengthened.
	Swellings and effusions are reduced.
	Gentle petrissage stimulates tissue growth.
	Hard petrissage lessens tissue growth.

Friction.—Friction is given with the heel of the hand, the cushion of the thumb, or the fingers. To give friction, make small successive circles over the prescribed area without moving the skin, exerting considerable pressure when not too painful. Always follow friction with effleurage.

EFFECTS.
- The inflammatory products are broken up and moved on into the veins and lymphatics, thus hastening absorption.
- Local circulation is stimulated.

Tapotement.—Tapotement, or percussion, may be given with the ulnar edge of the hand, the palm of the hand, the tips of the fingers, or the closed hand. It is known, according to the method employed, as ulnar, palmar, digital, or fistic percussion. It may be given with one hand or both hands, and the application of the latter may be alternated or simultaneous.

- Ulnar percussion is generally used upon the back.
- Palmar (simultaneous), on the extremities.
- Fistic (either alternate or simultaneous), on the glutei.
- Digital (either alternate or simultaneous), on the head.

EFFECTS.
- Moderate percussion causes contraction of the blood-vessels.
- Moderate percussion increases the irritability of the nerves.
- Moderate percussion applied across muscles increases their contractibility.
- Prolonged percussion causes the dilatation of the blood-vessels.
- Prolonged percussion causes temporary paralyzation of the nerves.
- Prolonged percussion applied across muscles will loosen contraction.

Pressure.—Pressure is given with the cushion of the fingers or with the knuckles, and usually follows the course of nerves or vessels.

EFFECTS.
- Pressure is sedative in neuralgic pains.
- Pressure causes local paralyzation of muscle.
- Pressure causes secondary increase of circulation.

Pressure should be used only by those thoroughly instructed in anatomy.

Vibration.—To give vibration, grasp the part to which vibration is to be given between the hands, fix your arms firmly and hold them stifly, producing a tremor in them which will be transmitted to the part of the body between your hands.

EFFECTS.
- Vibration produces stimulation in palsies.
- Vibration acts as a counter-irritant.
- Vibration produces changed nutrition.

Circumduction.—Circumduction may be either passive or active.

In circumduction, "some part of the body is made to describe with its longitudinal axis the surface of an imaginary cone." The circle is made as large as the joint permits. Large limbs are moved slowly, small ones more quickly.

EFFECTS.
- Blood is drawn from the moving extremity.
- Absorption is increased.
- Tendons, etc., are made more pliable.
- Articular adhesions are broken up.

Rotation, Flexion, etc.—The names describe the movements. The effects are those of assistive or resistive movements in a less marked degree.

Active Movements.—Active movements are either single, assistive, or resistive.

Single movements are those performed by the patient and constitute the movements of educational gymnastics.

In assistive movements the operator helps the patient.

In resistive movements the operator resists the patient. These movements should be given slowly and evenly.

Effects.
- Coördination is increased.
- The circulation is improved.
- Absorption is hastened.
- Metabolism is improved.
- Nutrition is improved.
- Adipose tissue is lessened.
- Muscular tissue is hardened.
- Adhesions are broken up.
- Joints are made more pliable.

GLOSSARY

ACUITY, distinctness, sharpness.
ANAPHYLACTIC, see page 219.
ANAPHYLATOXIN, a poison that will induce an anaphylactic reaction
ANESTHESIA, loss of sensation.
ANOREXIA, loss of appetite.
ANURIA, a deficiency or absence of urine.
ASCITES, collection of fluid in the abdominal cavity, *i. e.*, abdominal dropsy.
ASTHENIA, loss of strength.
ATONY, want of tone, debility.
ATROPHY, wasting of a part from faulty nutrition.
ATYPICAL, irregular, not typical.
AURA, a peculiar sensation preceding an epileptic attack.
AUTOGENETIC, self-produced.
AUTOTOXIN, any poisonous substance arising within the body.

BICONCAVE, hollow on both surfaces.
BICONVEX, rounded on both surfaces.
BOUGIE, a slender cylindrical instrument for dilating canals such as the urethra.

CACHEXIA, a depraved condition of nutrition.
CARPHOLOGY, (carphologia) involuntary picking at the bed-clothes.
CIRCUMSCRIBED, clearly defined and localized.
COALESCE, to unite.
COMMON BILE DUCT, the duct through which the bile and the pancreatic juice flow into the small intestine.
COMPONENT, an ingredient.
CONCOMITANT, accompanying.
CONFLUENT, running together.
CONSTITUTIONAL DISEASES, those which affect the whole system.
CORYZA, catarrhal inflammation of the nose (cold in the head).

CYTOPLASM, protoplasm, cytoplasm or protoplasm constitutes the greater part of the cells which are the basis of all living matter.

DEHYDRATION, the removal of the component water.
DEVITALIZE, to destroy the vitality or strength.
DIAGNOSIS, the recognition of a disease from its symptoms, etc.
DIAPEDESIS, the passage of leucocytes through unruptured blood-vessels.

ECCHYMOSIS, extravasation of blood into areolar tissue.
ENDOCRINE GLANDS, the ductless glands.
ENUCLEATED, a shelling out, as of a tumor.
ERYTHEMATOUS, a term applied to certain skin affections associated with redness and also to diseases, such as scarlet fever, measles, etc., which are associated with such skin affections.
ERYTHROCYTES, red blood-corpuscles.
ETIOLOGY, the science of the causes of disease.
EVERSION, turning outward.
EXACERBATION, increased severity of symptoms.
EXFOLIATE, falling off in scales.
EXTRAVASATION, an effusion of fluid into the tissues.

FLATULENCE, the presence of gas in the digestive canal.
FLATUS, gas in the alimentary (digestive) canal.
FOMITES, substances capable of absorbing and transmitting contagium.
FURUNCLE, a boil, a circumscribed abscess.
FURUNCULOSIS, the formation of furuncles.

GLYCOSEMIA the presence of excess glucose in the blood.
GLYCOSURIA, sugar in the urine.
GRAVID, pregnant.

HEMOLYSIS, abnormally rapid destruction of red blood-corpuscles.
HEMOPTOSIS, spitting blood, the term is used especially for hemorrhage from the lungs.
HERPES SIMPLEX, fever blisters.
HERPES ZOSTER, shingles.
HYALINE, having a glass-like appearance.
HYPEREMIA, abnormal fullness of blood-vessels.
HYPERESTHESIA, excessive sensibility.

HYPERPLASIA, enlargement of a part as the result of an increase in the number of its tissue cells.
HYPERSENSITIVE, over-sensitive.
HYPERTROPHY, enlargement of a part as the result of enlargement of its cells.

IDIOPATHIC, spontaneous, primary.
IMMOBILIZE, to fix a part in a manner to prevent motion.
IMPERVIOUS, not permitting passage.
INCOMPATIBLE, incapable of harmonious subsistence or combination.
INFARCTION, the plugging of a vessel by an embolus.
INGESTION, the introduction of food or liquid into the body.
INHIBIT, to check or restrain.
INIMICAL, adverse, injurious.
INJECTED, congested.
INSOMNIA, sleeplessness.
INSTILLATION, the act or process of dropping a liquid into a cavity or the eye.
INTRAVENOUS, within a vein.
INVAGINATED, inclosed in a sheath, etc.

JUXTAPOSITION, in close proximity.

KERATITIS, inflammation of the cornea of the eye.

LACRIMATION, an excessive secretion of tears.
LETHARGIC, drowsiness.
LEUCOCYTES (leukocytes), white blood-corpuscles.
LEUCORRHEA, a whitish vaginal discharge.
LIENTERY, undigested food in the stools.
LUMEN, the cavity of a tube.

MALAISE, a feeling of general discomfort.
METABOLISM, the changes constructive (anabolic) and destructive (catabolic) that occur in the body tissues.
MICTURITION, the act of voiding urine.
MORBID, pertaining to disease, unhealthy.
MUCOPURULENT, containing mucus and pus.

NEURITIS, inflammation of a nerve.
NEUROSIS, a nervous affection occurring without any discoverable lesion.

NOCTURNAL, pertaining to the night.
NOXIOUS, poisonous.
NUCLEUS, the vital part of a typical tissue cell, the nucleus controls the nutrition of the cell.
NYSTAGMUS, a continual rolling movement of the eyeballs.

OCCIPUT, the back part of the head.
OCCLUDED, closed.
OCCULT, hidden, obscure.
OCULAR, pertaining to the eyes.
OPACITY, the state of being opaque, *i. e.*, not transparent; impervious to light.
OPHTHALMIC, pertaining to the eyes.
ORIENTATION, the act of finding, or knowledge of, one's true position.
OTITIS MEDIA, inflammation of the middle ear.

PABULUM, food, anything nutritive.
PALLIATIVE mitigating, relieving.
PALPITATION, violent pulsation, as of the heart.
PALSY, loss of voluntary control of muscles.
PAPULAR, consisting of papules, *i. e.*, small circumscribed solid elevations of the skin.
PARENCHYMA, the secreting or functionating tissue of an organ.
PARESIS, slight paralysis.
PARESTHESIA, certain disagreeable sensations, such as numbness, itching, tingling, etc.
PATHOLOGICAL, pertaining to disease.
PETECHIA, a small discolored spot resulting from a minute extravasation of blood into the skin.
PHLEBITIS, inflammation of a vein.
PHOTOPHOBIA, extreme sensitiveness to light.
PHYSIOLOGICAL PROCESSES, normal body processes or functions.
PROGNOSIS, prediction of the course and results of a disease.
PSYCHONEUROSIS, a functional (*i. e.*, not associated with any discoverable lesion) mental disease.
PTOSIS, dropping, as of the eyelids from paralysis or abnormal depression of other organs.
PUNCTIFORM, having the form of a point.
PUSTULAR, consisting of pustules, *i. e.*, small circumscribed elevations or blebs of the skin containing pus.

RECRUDESCENCE, the return of symptoms, a relapse.
RESOLUTION, decomposition and absorption.
RHINITIS, inflammation of the nasal mucous membrane.

SCARIFY, to make a small superficial incision.
SEQUEL, sequela (plural sequelæ), a disease, or morbid symptoms following another disease.
SLOUGHING, the formation of sloughs, *i. e.*, dead tissue that separates from sound parts.
SOMNOLENCE, sleepiness, drowsiness.
STASIS, stagnation of the blood-current.
STATIC, at rest.
SUBSULTUS TENDINUM, involuntary muscular twitching.
SUPPURATION, the formation of pus.
SYNCOPE, fainting.

TENESMUS, ineffectual straining at stool or during micturition.
TINNITUS AURIUM, ringing in the ears.
TRAUMA, a wound.
TROPHIC, pertaining to nutrition.

ULCERATION, the formation of ulcers, *i. e.*, open sores.

VASOMOTOR CHANGES, changes in the tension of blood-vessels such as are caused by increase or decrease in their caliber.
VERTIGO, dizziness.
VIRUS, a morbid product, a pathogenic microbe, any contagious or noxious matter.
VISCUS, an internal organ.

INDEX OF DEMONSTRATIONS

Demonstration

GENERAL INDEX

A Sound Economic Basis For Schools of Nursing

And Other Addresses

By

Mary Adelaide Nutting, R.N., M.A.

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Miss Nutting has been for many years closely in touch with all of the various questions connected with nursing. There is probably no one who has been more active or played a more important part in nursing education, as well as in the raising of nursing standards and requirements.

In this collection of addresses she makes permanently available to all those having at heart the welfare of this great profession the wisdom drawn from her years of experience, and the opinions she has expressed at various times to representative bodies of hearers in regard to the problems arising in the growth and development of Schools of Nursing.

Miss Nutting's book should be of interest to all members of the nursing profession, as well as to those concerned in hospital administration.

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